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VETERINARY MEDICINE

JUNE 1942

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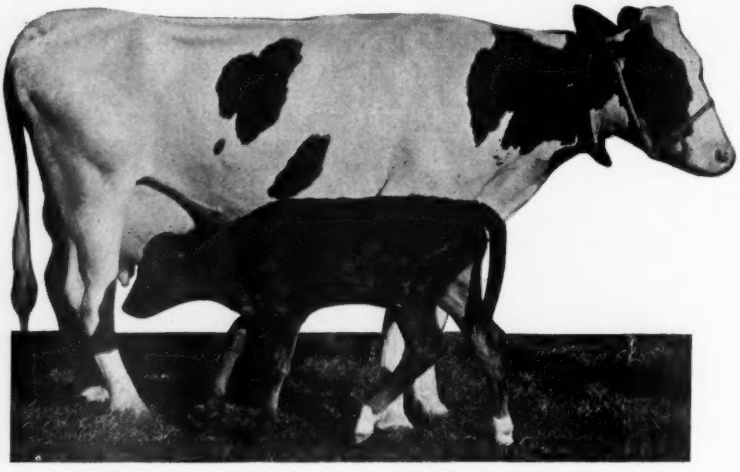
7632 S. Crandon Ave.
Chicago, U.S.A.

Clinical Use of Ascorbic Acid



THE CASE HISTORY — TREATMENT — RESULTS

This cow exhibited fourteen consecutive regular heat periods, and was bred ten times without conceiving. She was bred early and late — naturally and artificially — even several times during estrus, without conceiving. Finally, a Vitamin C determination made on her blood at the time of estrus revealed that the customary peak concentration of the vitamin did not occur. Accordingly, 2 grams of Ascorbic Acid were administered intravenously and 2 grams subcutaneously; the cow was bred immediately. The result of this treatment is seen in the above photograph.

Much credit is due Dr. Paul H. Phillips of the University of Wisconsin for proving that Ascorbic Acid therapy is often beneficial in causing conception among hard-to-settle and shy-breeding cows. Phillips' investigations have also shown the usefulness of Ascorbic Acid in improving the breeding efficiency of so-called slow-breeding bulls.

Recommended Dosage

For hard-to-settle and shy-breeding cows

2 grams administered subcutaneously and 2 grams given intravenously on the day of breeding. This dose schedule has been effective in 60-65 per cent of the cases studied. For cows that fail to respond, more intensive treatment consists of follow-up doses of 2 grams administered subcutaneously twice weekly for three weeks after breeding.

For Bulls—2 grams per 1000 pounds of body weight, administered subcutaneously twice weekly for three to six weeks as indicated.

Packages

50-c.c. vial (4 grams) **$0.90**
Sufficient for complete treatment of average cow.

250-c.c. vial (20 grams) **$3.60**
Bulk package—especially suitable for treatment of bulls.

Each 25 c.c. of Ascorbic Acid Solution contains 2 grams of Ascorbic Acid, which is equivalent to 40,000 International units of Vitamin C.

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KANSAS CITY, MISSOURI

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Trichinosis was the cause, at least in part, for the Hebrew prohibition against pork which was promulgated by Moses.

Sulfaguanidine has been found effective in the treatment of cecal coccidiosis in poultry by J. R. Beach of the University of California College of Agriculture. Further tests are being made to ascertain if the drug may not prove of value in related poultry diseases.

Effective public health work must aim at controlling disease producing agents at their source, and since animals are the reservoir for a considerable number of such agents, it is obviously necessary to have close cooperation between human and veterinary medicine.

Vitamin B_1 is found in every living tissue that has been critically examined. It is demonstrably required not only by every common mammalian species, including man, but is also indispensable for flies, beetles, certain worms, bacteria, molds, fungi and yeast. The higher plants fabricate hundreds of tons of B_1 annually and store it in their seeds in large quantities.—*Science.*

The toll of animal disease in this country has never been compiled and is unappreciated.

Xenophen, besides being a general of renown, was a veterinarian of parts. When one contemplates his feat of conducting successfully a retreat of 10,000 mounted troops for many hundreds of miles through hostile territory, infested then as now, with animal plagues, one must credit his veterinary skill equally with his military genius for a martial exploit without parallel in history.

Sulfanilamide and other sulfa derivatives, including sulfapyridine, sulfadiazine and sulfathiazole, have come into wide use in human medicine for the treatment of infections of the eye and contiguous parts. Experiments on cats by Schele and Souders to determine to what extent these products enter the aqueous humor, revealed that when given internally all compounds tested, except sulfathiazole, occurred in therapeutic concentrations in the humors of the eye. This accords with clinical experience of many veterinarians, who have used these preparations in pan-ophthalmitis with highly satisfactory results.

Freezing Destroys Trichinae

That trichinae in pork can be destroyed by freezing is reported by the Department of Agriculture. To destroy the parasites a temperature of 5°F. for 20 days; 10° below zero for ten days or 20° below for six days, is required for a section of pork or pork product not more than six inches thick. Many of the food lockers where farmers keep their meats do not have a temperature low enough to kill the trichinae.

Veterinarians Progressive

Bacillary dysentery has become much more prevalent in the past few years than formerly. Heretofore few cases have been reported in which sulfaguanidine has been used in the disease but Doctors Rantz and Kirby, San Francisco report* satisfactory results in a number of cases of healthy carriers of this type of dysentery. Such use extended and confirmed should prove of inestimable value in civil life and in the armed forces. In the short period that has elapsed since its introduction, sulfaguanidine has attained wide use in small animal practice.

Antibodies Made Synthetically

The synthetic formation in glass vessels of antibodies has been reported by scientists at the California Institute of Technology by Professors Pauling, Campbell and Dr. Pressman. According to their theory, antibodies are formed by the modification in shape and structure of the large molecules of certain blood proteins, known as serum globulins, which takes place in the presence of disease germs or virus particles. This modification in molecular form of the globulins enable them to arrest and render harmless the invasion in the blood of germs or virus particles like those which modified them originally. Heretofore such antibodies have been formed only within living bodies as a defense mechanism in disease. As yet it is not known whether it will be possible to prepare in the laboratory sufficient disease-fighting antibodies for clinical use.

* *J.A.M.A.* April 11, 1942, p. 1268.

A new, modern, air conditioned veterinary dispensary has been established at Fort Jackson (S.C.) for the care of the 500 horses of the 102nd Cavalry stationed there.

Niacin

Nicotinic acid is to be called niacin and the amide will be niacin amide if the name selected for this vitamin by the Food and Nutrition Board of the National Research Council is adopted. It is hoped this name will help to offset the effect of the commonly heard fallacy that nicotinic acid is made from tobacco and is of the nature of nicotine. To be sure, this vitamin was first obtained from nicotine, but practically all now being produced is made synthetically by the oxidation of a coal tar derivative.

Frozen Dried Plasma for Hemophilia

It has been found by the University of Rochester School of Medicine that frozen dried blood plasma is of value to persons affected with hemophilia. Upon receiving weekly injections of 125cc of the plasma into the veins, a totally disabled patient so far recovered that he was able to do light work.

Plasma has an advantage over whole blood for such purposes in that it is more readily available and does not need to be typed. It has proved valuable when teeth were extracted from a hemophiliac patient.

New Plant Insecticide

The tree tobacco, a weed growing in arid sections of Mexico and southwestern U. S. has become of importance since scientists have extracted anabasine from it. This is a colorless liquid, used as an insecticide, which turns brown on standing and chemically resembles nicotine. Dr. R. C. Roark, of the U. S. Department of Agriculture reports that anabasine is four to five times as effective as nicotine as an insecticide. It has been produced synthetically, although not on a large scale, for about six years. Tests have been suggested to determine its anthelmintic value in stomach worm infestation in sheep and as a parasiticide of poultry.

Medical, Dental, and Veterinary Census

The Procurement and Assignment Service of the Office of Defense Health and Welfare Services, Federal Security Administration, will mail during the month of April a short questionnaire and enrollment form to every licensed physician, dentist and veterinarian in the United States. The questionnaire is designed to bring up to date for war purposes all information obtained by the American Medical Association, The American Boards of Medical Specialties, and other national organizations which have pooled and made available their information.

It is desired that all medical, dental, and veterinary officers on active duty complete and return the questionnaire following receipt. It is believed that this will not only assist the Procurement and Assignment Service in their problem of obtaining physicians for the armed services, but will assist this office by making available information relative to qualifications in specialties.—*War Dept. Circular Letter No. 36, dated April 20, 1942, Office of Surgeon General.*

* * * *

Veterinary Practice a Profession and a Business

One of the earliest discoveries that the veterinary graduate makes when he enters the field of practice is that veterinary practice is both a profession and a business, neither one to the exclusion of the other. He finds that his work must be a constant compromise between a profession and a business and here most recent graduates make their first mistake. Unless a practice is conducted on business lines, it fails for want of remuneration and a man cannot continue in practice, professionally or otherwise. On the other hand, there are certain fundamentals of his profession that he cannot compromise with and be successful. Where there is an absolute conflict between professional methods and business methods, the professional must always prevail or it ceases to be professional at all, and he cannot succeed in veterinary medicine, which after all is his profession.

The adjustments are sometimes somewhat delicate and it is not surprising that mistakes, many of them, occur. Fortunately indeed the professional thing to do is, in the overwhelming majority of cases, the business thing to do and the business side of practice really supplements and complements the professional phase; and makes continuation in practice possible.

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Veterinary Students Receive Reserve Commissions

On April 17th the Secretary of War authorized the commissioning of veterinary students in the Medical Administrative Corps Reserve. This will put them out of reach of local Selective Service Boards. Earlier it was thought the recommendation of General Hershey, Director of the Selective Service, that veterinary students be deferred until they had completed their professional education, would meet the need for maintaining a steady flow of veterinary graduates for the Army and Civil Service and for the needs of agriculture. However, in a few instances Selective Service Boards, with whom a considerable number of veterinary students were enrolled, did not heed the recommendation of Director Hershey and practically all but senior veterinary students were classified in class 1A.

Under the new arrangement, which is now official, any veterinary student who is qualified physically will be given a reserve commission in the M.A.C. This he may hold until three months after he is graduated provided he remains in school and attains a satisfactory proficiency in his studies. Upon graduation he may be given a commission in the Veterinary Reserve if his services are required by the Army. Or if his services are not needed in the military forces he will be available to the civil government or to the civilian population at the discretion of his Selective Service Board.

* * * *

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* * * *

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Front row (left to right): Lt. W. O. Brinker, C.Q.M.D., Instructor; Lt. Phillip W. Tedder, Ft. Bliss, Texas; Lt. Colonel Charles C. Wright, Ft. McClellan, Ala.; Lt. Colonel Louis L. Shook, C.Q.M.D., Director of School; Major Horace L. Anderson, Ft. Jackson, S. C.; Major Guy Castleberry, Camp Wallace, Texas; Lt. C. N. Decker, C.Q.M.D., Instructor

Second Row: Lt. Elmo L. Maurer, Ft. Lewis, Wash.; Lt. Theo. C. Kragness, Drew Field, Fla.; Capt. James H. Hathaway, Ft. Riley, Kans.; Lt. Elwin R. Prather, Ft. Leavenworth, Kans.; Lt. David E. Lusk, Ft. Knox, Ky.; Lt. Wm. M. Dungan, Vet. Sta. Det., Salt Lake City, Utah; Lt. Jacob H. Ricker, Jersey City QM Depot, Jersey City, N. J.

Third Row: Lt. Edward P. Chazey, Ft. Monmouth, N. J.; Lt. Howard J. Bly, Ft. Wayne, Mich.; Lt. Lucius N. Butler, Jr., A.C.A.F.S., Roswell, N. Mex.; Lt. Clifford O. Enge, Camp Funston, Kans.; Lt. Abe Levy, Ft. Brown, Texas; Lt. Marcel Y. Carpenter, Ft. Bragg, N. C.; Lt. Bernard B. Rovner, Aberdeen Proving Ground, Md.; Lt. Geo. C. Tanenbaum, Camp Funston, Kans.; Lt. Joseph Belinsky, Camp Edwards, Mass.; Lt. Dean L. Niffenegger, Camp Gordon, Ga.

THE SCHOOL OF MEAT AND DAIRY HYGIENE

The rapid increase in the Army is creating a great need for veterinary officers trained in the army technique of food inspection. To supply this need a meat and dairy hygiene school was established at the Chicago Quartermaster Depot at the beginning of 1941. The meat packers of Chicago have willingly cooperated with the Quartermaster in connection with the school. Each month a class of approximately 20 officers has received training. The purpose of this school is to teach all the officers a standard method of inspection which will insure the consumption of good food of uniform quality throughout the Army. Such a system of inspection also affords protection to the meat packers by offering assurance that all packing houses are dealt with in the same manner. The officers are selected by Corps Area Veterinarians, subject to the approval of the Surgeon General of the United States Army. Lt. Col. Fred C. Waters, V.C. is commanding officer of the school. Those in attendance at the school which closed April 22nd are pictured above.

How They Were Appointed

The veterinary members of the nine Corps Area committees, listed on page 194 of the May issue of VETERINARY MEDICINE, were nominated by the Committee on Veterinary Medicine of the Service upon request from the directing board. The chairmen of the Veterinary Preparedness Committees of the 48 states and the District of Columbia were, in each instance, nominated by and with the approval of their respective veterinary medical associations or the executive committees thereof. The nominations of all these veterinary representatives were then recommended by the Directing Board for official appointment which was made by Paul V. McNutt, Administrator of the Federal Security Agency under which the Procurement and Assignment Service functions. The committees' functions are purely advisory.

Fever Depresses Antibody Formation

Since the experiments of Rolly and Meltzer in 1908 it has been thought that high temperatures increased antibody production in the presence of infections. Since the report of von Wagner-Jauregg[1] on the beneficial effects of artificial malarial infection on tabes dorsalis and dementia paralytica "fever therapy," diathermy has attained great popularity.

Recently Ellingson and Clark[2] of the University of Wisconsin, have demonstrated conclusively that temperatures above normal depress antibody production as much as 75%.

From their data it would seem that artificial fever not only inhibits specific antibody formation but accelerates antibody destruction. The fact that artificial fever reduces antibody titer, however, does not justify the conclusion that fever therapy is without beneficial effects. Carpenter and his associates,[3] for eample have demonstrated that fever temperatures may actually kill gonococci and the spirochete of syphilis. Dyson[4] and Shaffer[5] have shown that the rate of proliferation of hemolytic streptococci and pneumococci is greatly reduced at temperatures above 40 C. (104 F.). Moreover, circulation may be stimulated and capillary permeability increased by hyperpyrexia, so that local toxic products may be more rapidly neutralized, diluted or removed, in spite of reduced antibody titer.

Finally, it is definitely known that the phagocytic power of leukocytes is increased by febrile temperatures. — *Excerps Jnl. A. M. A.*, April 18, 1942.

[1] von Wagner-Jauregg, Julius, 1918-19. Psychiat.-neurol. Wchnschr, 20, 132, 251.
[2] Ellingson, H. V., and P. F. Clark, 1942. Jnl. Immunol, 43, 65.
[3] Carpenter, C. M.; Ruth A. Boak; L. A. Mucci; and S. L. Warren, 1933. Jnl. Lab. & Clin. Med. 18, 981.

Vitamin A Deficiency and Reproduction

At the Ohio Experiment Station it was shown that—

1. Vitamin A deficiency in cows resulted in (a) dead or weak calves and (b) retained placentae.

2. Vitamin A deficiency in sows resulted in (a) disturbance of the estrual cycle and (b) dead or weak pigs.

3. Vitamin A deficiency in ewes resulted in lambs dying in utero or soon after birth.

4. All these reproductive disasters may occur without the dams themselves showing clinical symptoms of vitamin A deficiency.

Extensive research by the Wisconsin agricultural experiment station, in an attempt to improve Sudan grass, indicates that before many more years a high-yielding, high-quality, low-prussic acid strain will be produced. Many of these experimental lines are now low in prussic acid, the poison responsible for the sharp decrease in acreage of Sudan grass, and so for all practical purposes may be considered non-poisonous. Hogg and Ahlgren of the Wisconsin station found most short immature Sudan grass to be high both in protein and in prussic acid. They were fearful lest reduction of the acid content might also reduce the protein content, but they are now convinced that it will be possible to develop high-protein, low-prussic acid strains.

[4] Dyson, C. B., 1938. J. Path. & Bac. 47, 641.
[5] Shaffer, M. M.; J. F. Enders, and James Wilson, 1938. Jnl. Clin. Inv. 17, 133.

Brucellosis in Swine Widespread

Brucellosis of swine is more widespread than is generally realized. At a recent veterinary meeting in Illinois, the following experience was reported. A swine raiser on an extensive scale, purchased a fine boar from a well-known breeder at a high price. This boar was infected with brucellosis and within two years the purchaser was compelled to dispose of more than a hundred sows and gilts and a few boars to free his premises of the disease. He then went from one purebred herd to another for several months before finding one free from brucellosis from which he could obtain boars.

* * * *

Swine Disease Control Projects

The extension service of the University of Illinois College of Agriculture in cooperation with the state Department of Agriculture and the federal Bureau of Animal Industry announces war emergency measures for the suppression and control of swine diseases.

The swine erysipelas control project provides that approved veterinarians will be supplied the culture for the culture-serum treatment for immunization, through these cooperating groups. Only those veterinarians who have received special field instructions in this procedure will be authorized by the State Veterinarian to use the culture in conjunction with the anti-swine erysipelas serum. The owner must sign a release before the veterinarian uses the new culture-serum treatment on his hogs.

In carrying out the swine brucellosis control project the state Department of Agriculture will accredit herds free from this disease on the basis of two negative tests at intervals of six months. Reacting breeding animals should be fattened for market. Further information and instructions are included in a leaflet (Project 1046, swine brucellosis)—supplied by the Agricultural Extension Service of the college.

* * * *

The building up of confidence in qualified veterinarians, on the part of the public, is a major obligation of organized veterinary medicine.

The Biggest Pig Crop

Uncle Sam has called upon the American farmer for more hogs, to meet mounting domestic and lease-lend requirements. The response promises to be tremendous. For instance: The 1941 fall pig crop is estimated at 35,580,000 head, which tops the 1940 outturn by 18%, and the previous record fall crop of 1939 by about 6%. That is pigs in a big way. Furthermore, present indications are that the 1942 spring crop also will hit a new high, since the number of sows to farrow is expected to be 28% larger than the number farrowed in 1941. The combined 1941 spring and fall pig crop is estimated at 85,035,000 head. This is only about 2% smaller than the record crop of 1939.

Last fall's pig crop (35,580,000 head), biggest ever farrowed, hardly had time to boast before it was announced that the number of sows to farrow in the spring of 1942 is 9,974,000—the largest on record. This points to the biggest spring pig crop ever: 62,000,000, if the litters average 6.2 pigs apiece.

* * * *

Swine Erysipelas Investigations

In further studies of arthritis in swine, the swine erysipelas organism was recovered from 76% of the affected animals. Specimens were submitted from various federally inspected meat-packing establishments, and examinations were made of about 500 specimens originating in 114 counties from 16 states, namely, Alabama, Arkansas, Florida, Iowa, Kansas, Maryland, Minnesota, Mississippi, Missouri, Nebraska, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, and Virginia. The highest incidence of infection as determined by this work continued to be in specimens from the Corn Belt.

Bacteriological examination of 336 serial lots of commercial hog-cholera virus revealed the presence of contamination with the swine erysipelas organism in nine lots.

Tests of a large number of swine erysipelas antisera for the purpose of establishing a standard product of uniform high potency were completed. The standard serum is supplied to commercial producers of antiserum for use in checking the potency of their product.—*From Report of Chief of Bureau of Animal Industry, 1941.*

The Chicago A.V.M.A. Meeting

A view of Michigan Avenue and Grant Park in Chicago. At the left, the Stevens Hotel, headquarters of the seventy-ninth annual meeting of the American Veterinary Medical Association, August 17-20, 1942

In step with the nation's all-out war effort, the seventy-ninth annual meeting of the American Veterinary Medical Association, which is to be held in Chicago, will be keyed to wartime problems confronting the veterinary profession.

The Committee on program reports that many outstanding papers have been volunteered for the section meetings and for the general sessions. Section meetings will be held on the mornings of August 18 and 19; general sessions on each of the four days of the meeting. The opening session will be held on Monday afternoon, August 17. All general sessions will be devoted to problems of nation-wide interest concerning the veterinary aspects of food conservation and military and civil activities. The contributors will be eminent speakers from the veterinary profession and from fields of medicine, nutrition, agriculture and public welfare.

For groups such as A.V.M.A. conventions, it is thought operative clinics have become outmoded and do not give returns commensurate with the expense and effort involved. For this reason the instructional material offered in past years on the clinical program will be replaced by a series of "clinical depictions," comprising motion pictures and other types of visual presentation on diagnosis, anesthesia and therapy—both surgical and medical. One or two hours each day will be given to this.

Alumni luncheons will be held on the last day of the meeting—August 20. This time was selected because no other special program features are scheduled for the afternoon of that day, thereby allowing ample time for after-lunch conversations.

The Cat's Paw

THERE is no objection on scientific grounds to the use of horse meat as a basis for a dog food. It is just as nutritious, just as adequate and just as much a "natural food" for a dog (or a man) as any other kind of meat; but it must have struck many members of the A.V.M.A. as strange that the only manufacturers of canned dog food, who have been induced to invest almost a thousand dollars in an A.V.M.A.-A.A.H.A. seal of approval, are horse meat canners. This circumstance is all the more striking when it is realized that of the large number of manufacturers of canned dog food there are only four the basis of whose product is horse meat. Of these, two have local distribution only and have no use for a seal of approval for national advertising—admittedly the seal costs too much for local use only. As it stands 100% of horse meat canners, who by any stretch of the imagination could be interested in a seal of approval for use in national advertising, have invested in a seal. Of the many other large manufacturers of canned dog food using beef, pork, mutton, chicken and a few who use fish, rabbit or whale meat, not one has bought the A.V.M.A.-A.A.H.A. seal of approval.

There can be no objection to the Association approving horse meat for dog food on the score that it is horse meat. But the wisdom of approving it to the exclusion of all other canned flesh (that is actually what has happened) can be questioned.

A sentimental objection by many dog owners to the use of horse flesh for their pets has long existed and still exists. Several veterinarians have admitted to the writer that they, themselves, entertain this scientifically unfounded prejudice. It is common knowledge that this prejudice against the use of horse meat as a food for dogs has been widespread among the dog owning public.

The A.V.M.A. dog food committee would have the membership of the Association believe that seal holders among the canned food manufacturers represent good salesmanship on its part. It does nothing of the sort. The canners of horse meat desired an endorsement of horse meat as a food for dogs by a scientific or other group that wields an influence with the owners of dogs. It was believed, and no doubt rightly, that an endorsement such as the one in which they contemplated investing, would aid in overcoming this sentimental prejudice against the horse meat of their products. They are not to be censured for that. Good business, if nothing else, demanded that this deterrent to the wider use of their product be overcome if possible.

However for the A.V.M.A. to approve only horse meat as a basis for canned dog food and urge its members and the dog owning public to use no other is at least impolitic. That has been done. Members have been admonished repeatedly—in the official journal, from the president, in papers prepared under the direction of the dog food committee and presented at state veterinary meetings—to confine their purchases and their recommendations to the approved foods. And, as we have just stated, only those containing horse meat among the canned dog foods have been approved.

Thus the A.V.M.A. has been put in the position of officially urging a boycott of such top-notch dog foods as Red Heart, Pard and Ideal (to mention the three best known brands). The promoters of the dog food testing project must know that of those dog foods containing horse meat, the Chappel products alone are in the same class, as to quality established by scientific research, with the foods mentioned above. Yet the committee has the effrontery to proclaim piously that they are acting in the interest of the dog.

This boycott policy, if the members were inclined to abrogate their common sense and follow the advice of the A.V.M.A. dog food committee, would set the meat packing industry against the profession and a large part of the veterinary profession against the

meat packing industry, which, among all great industries (including agriculture) has been outstanding in its friendliness to the veterinary profession. Directly and indirectly the meat packing industry affords employment to 1000 veterinarians. Without it, the present livestock industry of this country (upon which two-thirds of the veterinary practitioners are dependent for a livelihood) could not exist. Can we afford to quarrel with this powerful industry—this important customer for veterinary skill—for a thousand dollars? That is the situation that continuation of the dog food approval project really portends.

Biologic Warfare

Belligerents are not always governed by peacetime international treaties or agreements. Marshall Foch once stated, "When a people puts its entire force into a war it is difficult not to use all arms, even though prohibited, if there is hope of victory in them." There is a general agreement among high military authorities, that no country deprive itself of effective weapons used by the enemy. Ramsay McDonald, former British premier, has been quoted as saying belligerents have the right to use any arm capable of bringing victory to them. A German view is expressed by Captain Meyer (Volkszeiting 2-11-21), who declared: "The country that discovers the most virulent microbe for scattering over the enemy and that has the most effective vaccine to protect its ownself will be victorious."

Parasites are capable of destroying much of the plant and animal life required in the successful prosecution of war. But whether they can be intentionally implanted in such a way as to become a useful arm of offense is a debatable question among military scholars. One group contends that a biologic or microbic arm in the military service is not practical, another group fears its potentialities, and a third group declares that no one, in the light of present knowledge, is justified in taking a positive stand on either side of the question. There is general agreement, however, on two counts: (1) If victory can be thus achieved, the method will be used, and (2) the defense against such an arm must be as well prepared and organized as the offense.

During the past decade, German and French veterinary periodicals have included much discussion of biological warfare. Rinderpest, foot-and-mouth disease, contagious pleuropneumonia of cattle, glanders, anthrax, hog cholera, brucellosis, psittacosis, tularemia and others are named in the category of animal diseases belonging to the microbic arm, and various plant parasites are pointed out as means of curtailing and corrupting food supplies.

While some writers contend that the danger is minimal, because for each of the known infections there are protective measures, others point out that such measures (vaccines, serums) are not generally available in sufficient quantity. Instances in which armies have been defeated and wars lost because of diseases among soldiers are familiar to every student of history. To deprive an army of sufficient food would hamstring it not less certainly than incapacitating it by infection; in fact might lead to just that. Disorganization, inescapable under the conditions obtaining in time of general mobilization, might make the suppression of epizootics difficult or impossible. Supported by a blockade, this might be decisive, and one is naive indeed who thinks this means would not be used by our enemies, if such were thought to be the case.

The conclusion seems inescapable that our military veterinary service should be prepared to combat intentionally implanted epizootics, not only among army animals but among those of the civilian population of occupied countries and that this preparation should include the immediate availability of the prophylactic requirements in any quantities that may conceivably be necessary. The possibilities of microbic warfare are so full of unknowns that the science of bacteriology should not fall asleep under the anesthetic of fancied security. Eleven "fifth columnists" were sentenced to death, in Russia in 1938, for "systematic weakening of agriculture by causing the death of 90,000 cattle." They had engaged in bacteriological sabotage.

VETERINARY OFFICERS OF THE TENTH OFFICERS' CLASS, MEDICAL FIELD SERVICE SCHOOL, CARLISLE BARRACKS, PA.

Front Row (left to right): Capt. Huston Odom, Ft. Bragg, N. C.; Major Thomas A. Ward, Ft. Ringold, Texas; Capt. Robert W. Cook, Q. M. Depot, Chicago; Lt. Joe G. Turner, Ft. Bliss, Texas; Capt. Allen S. Van Sant, Indian Town Gap, Pa., 28th Div.
Second Row: Lt. Floyd B. Watts, Ft. Bliss, Texas; Lt. Claude O. Wilder, Ft. Sill, Okla.; Lt. Homer B. Brown, Ft. Bliss, Texas; Lt. Walter A. Lawrence, Ft. Sam Houston, Texas
Third Row: Lt. Alex. Morris, Ft. Hancock, N. J.; Lt. Edward P. Chazey, Ft. Monmouth, N. J.; Lt. Merle L. Ferris, Camp Claiborne, La.

Since the beginning of 1941 the Medical Field Service School, Carlisle Barracks, Pennsylvania, has offered intensive courses for the training of medical, dental, veterinary and medical administrative officers in field duties. The course is of two months duration and the number in attendance varies from about 250 to 400. The veterinary attendance of these courses has been from 12 to 20. In the main the instruction is purely military and is the same for all four groups of officers. Some of the instruction, however, is strictly medical, dental or veterinary and is given to the groups separately. Veterinary officers receive 64 hours of special veterinary work during the course. The halftone includes the veterinary officers of the 10th course ending February 28.

The grounds of the Medical Field Service School adjoin Carlisle, which was established in 1720 by French Trappers. The old Hessian Guardhouse, built in 1777 by prisoners captured earlier in the Revolution, is at present being utilized as a post office for the School. Carlisle was a cavalry post at the time of the Civil War and was the most northern point reached by the Confederate Army. It was almost completely destroyed in that encounter but later became the nation's first artillery post. In 1879 the post was replaced by the first nonreservation Indian School (Carlisle — the school of Jim Thorpe of gridiron fame.) This is now the site of the Medical Field Service School. The eastern terminus of the Pennsylvania pike is at Carlisle.

Johne's Disease of Sheep*

By D. F. EVELETH, REBECCA GIFFORD and C. H. ANTHONY**

SHEEP production has become so unprofitable in certain areas that sheep raising has been practically discontinued. The usual history in many of these flocks shows an early period of low mortality and good lamb and wool crops. Later the number of ewes dying increases, there is considerable loss of wool from shedding, and a decidedly lower lamb crop. The third phase is characterized by a low lamb crop, high suckling lamb mortality, and later death of most of the yearlings that survive the first year as well as death of many of the older ewes.

The symptoms described in most cases are characteristic. Following lambing or a period of feed shortage the ewes frequently develop anorexia with a mild to severe diarrhea and rapid loss of weight. The sheep become very weak, are unable to stand, and finally die (Fig. 1).

Post mortem examination of these animals reveals a slight to heavy infestation of internal parasites. There is usually a mild to severe gastroenteritis with some thickening of the intestinal mucosa. There may be some lymph nodes containing a thick yellow to green pus. Calcified nodules may be found in the intestinal walls, mesentery, lymph nodes, and liver. The usual diagnosis is "death due to parasitism."

Preliminary tests conducted in cooperation with representatives of the United States Department of Agriculture, Bureau of Animal Industry showed that many sheep reacted positively to intradermic johnin. Post mortem examination of many of these animals revealed acidfast bacilli in scrapings from the intestinal mucosa.

Bacteriological examinations of the abscesses found in some sheep have yielded pure cultures of organisms similar in many respects to the organisms comprising the *subtilis* group[1].

Johne's disease in sheep was first reported in the United States by Howarth[2] and later by Butler[3]. McEwen[4] has made the most recent detailed study of ovine Johne's disease in the British Isles, where it was first reported by Stockman[5].

The veterinary practitioner has at his disposal two common procedures for diagnosing a condition such as ovine Johne's disease. He must depend on the history, symptomatology, and post mortem examination, or he must have available a diagnostic testing agent. Avian tuberculin has been used for the diagnosis of Johne's disease in sheep and was found superior to johnin by Howarth[2]. This test depends on a temperature reaction which may be slight. It is not convenient for large scale testing by a single operator. It was, how-

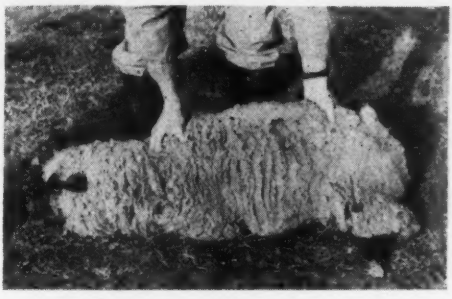

Fig. 1. A heavily parasitized ewe, unable to stand. Acid fast organisms were numerous in the intestinal scrapings from this animal

* Research Paper No. 726, Journal series, University of Arkansas. Published with the approval of the Director of the Arkansas Agricultural Experiment Station.

** C. H. Anthony resigned May 1941.

[1] Schweiger, L. B., D. Trainer, and D. F. Eveleth, 1941. A descriptive study of a spore forming bacillus isolated from Actinobacillotic-like lesions. Missouri Valley Branch of the American Society of Bacteriologists, Columbia, Mo.

[2] Howarth, J. A., 1932. Paratuberculosis enteritis in sheep caused by an acidfast organism. *J.A.V.M.A.* 81, pp. 383-387.

[3] Butler, W. J., 1940. Johne's disease. *J.A.V.M.A.* 91, p. 664.

[4] McEwen, A. D., 1939. Investigations on Johne's disease of sheep. *Jnl. Comp. Path. and Therap.* 52, p. 69.

[5] Stockman, S., 1911. Johne's disease in sheep. *Jnl. Comp. Path. and Therap.* 24, p. 66.

ever, used successfully by Howarth[2] and McEwen[4].

Intradermic johnin developed by the United States Department of Agriculture, Bureau of Animal Industry appears to be the diagnostic agent of choice at the present time. Such a testing agent is necessary since the symptoms and gross pathology

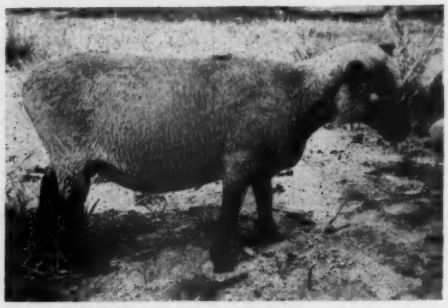

Fig. 2. A reactor ewe, from which acidfast organisms were demonstrated from intestinal smears

of Johne's disease may be very misleading. (Fig. 2.)

Hutyra, Marek and Manninger[6] list the following lesions of ovine Johne's disease. "On post mortem examination the mucosa of the small intestine and sometimes also of the large intestine, is much thickened, but not corrugated; its surface is uneven and coated with large quantities of mucus. In the submucosa punctiform or linear hemorrhages are present. The mesenteric lymph glands are moderately enlarged and their tissues infiltrated." Butler[3] has presented evidence that the small intestine may be not only thickened but definitely corrugated in ovine Johne's disease. Howarth's[2] description of Johne's disease in sheep stresses the thickening of the walls of the large and small intestines, as well as the thickening and folding of the mucous membranes.

McEwen[4] mentions thickening of the walls of the jejunum, ileum, and cecum in this disease. He also points out that the intestines from sheep with Johne's disease break more easily than the intestines of normal sheep. In two cases he found acidfast organisms in the abomasum and the ileum. Enlargement of the small lymph nodes adjacent to the areas of thickened intestine were considered by McEwen[4] to be of more diagnostic significance than the enlarged mesenteric lymph nodes.

Post mortem examination of the viscera of sheep from flocks having heavy losses, and in which acidfast bacilli have been found, has indicated that the gross pathology is a very poor criterion on which to base a diagnosis. The visible lesions produced by Johne's disease are similar in many respects to those produced by other factors causing the various types of gastroenteritis.

The abomasum presents varying degrees of gastritis. The inflammatory reaction with the thickened mucosa and excessive amounts of mucus can be caused by stomach worms as well as by Johne's disease. Smears from the region of the pylorus frequently contain organisms similar to the Johne's bacillus in their staining properties and morphology.

The duodenum is usually streaked with raised folds of the mucous membrane, the crests of which are definitely red. There is generally an excess of yellow to gray mucus. Sometimes the reddened areas cover the entire mucous membrane of the duodenum. In the jejunum a similar condition prevails except that in the region of the Peyer's patches there is more of a tendency for an increased thickening of the area.

The ileum, especially in the lower portion, often presents reddening with excess mucus. In the lower ileum there are more nodules produced by the *O. columbianum* larvae, so that thickening of the gut wall due to Johne's disease is masked by the tissue reaction caused by the parasites. In many cases there are so many nodules in this area that it is impossible to find any normal appearing tissue. In some cases the crests of the folds of mucous membrane are not hyperemic and may even appear anemic (Fig. 3).

The ileo-cecal valve and cecum are the areas most frequently involved in both Johne's disease and nodular worm disease. The inner surface of the cecum frequently

[6] Hutyra, F., J. Marek, and R. Manninger, 1938. Pathology and Therapeutics of the Diseases of Domestic Animals, 4th ed. Alexander Eger, Chicago.

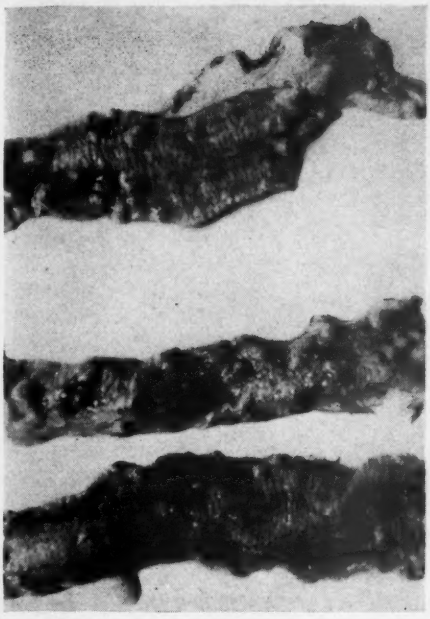

Fig. 3. Sections of the small intestine of the ewe shown in Fig. 2

presents so many nodules that if small folds were produced by the Johne's bacillus they would be included in the thickened tissues surrounding the nodules. Large reddened areas in the cecum are very common (Fig. 4).

The anterior portion of the colon is often thickened, but as a rule it does not present the reddened areas more commonly found in the small intestine. However, in some cases red crested folds are found in this area and also in the remaining portion of the large intestine and rectum. The mesenteric lymph nodes are slightly edematous. Dependence on the gross pathology of the lymph nodes for the diagnosis of Johne's disease is frequently misleading due to the presence of edema caused by parasitism and micro-organisms other than Johne's bacillus. However, it is frequently possible to demonstrate acidfast organisms in the lymph nodes of the sheep.

A very interesting exception to the above description of ovine Johne's disease is illustrated in the following case. An eight-year-old ewe was introduced into a flock May 23, 1941. On July 25 an intradermic johnin test revealed very slight thickening of the caudal fold at the site of the injection. The ewe was in a moribund condition with labored breathing and a mild diarrhea. She was killed for post mortem examination. The symptoms were probably caused by abscesses in the turbinate bones and a heavy infestation of lung worms.

The stomach and intestines presented no visible thickening or reddening of the mucous membranes. There were no large nodules in the intestines from nodular worm infestation. Acidfast organisms were

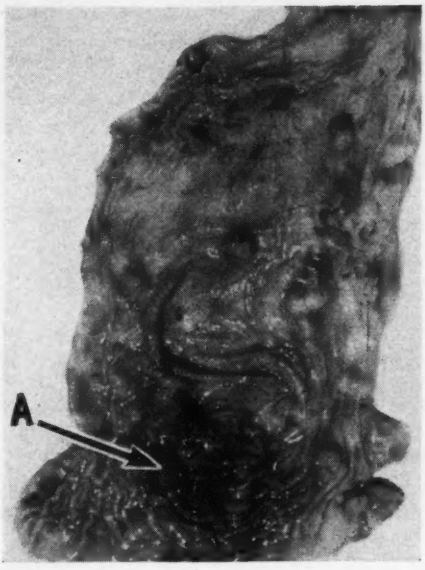

Fig. 4. A typical cecum of a sheep showing involvement of the ileo-cecal valve (A)

demonstrated in several smears prepared from the ileum, ileocecal valve, and the cecum.

Uncomplicated Johne's disease in sheep under field conditions is probably never encountered. The symptoms vary from flock to flock and in each case it would be just as logical to ascribe them to another disease or to parasitism as to Johne's disease. In flocks with a high percentage of reacting animals loss of wool is common and intermittent diarrhea is present. Several flock owners have reported a high inci-

dence of lameness in both lambs and mature sheep but in these flocks the presence of a mineral deficiency cannot be eliminated. Other symptoms of Johne's disease include extreme emaciation, lactation failure, excessive thirst, and weakness.

In certain cases sheep exhibiting all of these symptoms have failed to react to intradermic johnin and it has been impossible to demonstrate acidfast organisms in the tissues. The opposite condition too has been encountered. In some flocks, old sheep in excellent condition have reacted to intradermic johnin and the organisms have been demonstrated.

Fig. 5. A vulvar injection with a positive response

The combination of severe parasitism and Johne's disease seems to be one of the most serious conditions found in field outbreaks. An example of this combination can illustrate the problem confronted by the livestock owner and the veterinarian. A small flock of 28 ewes and two wethers was kept on a small farm in northwest Arkansas. During the fall and winter of 1940-41, 17 ewes died. The histories were all similar. Either just before or just after lambing the ewes would develop a severe diarrhea, lose weight, finally become very weak, and die. The flock was observed March 24, 1941, and an old ewe was killed for examination. She was found to be heavily infested with *H. contortus*. The intestines presented no lesions suggestive of Johne's diseases although acidfast organisms were demonstrated in the tissue smears. The sheep were treated by the owner with Nema capsules and no further losses were reported.

This flock was tested with intradermic johnin May 9, 1941. At this time 12 of the 13 mature sheep reacted to the test. These data suggest the possibility that Johne's disease so weakened many of the sheep that they readily succumbed to the parasitism. It is also important to note the very low percentage of lambs. There were only six living lambs from 11 ewes. Two of these lambs reacted to the johnin test. The owner reported in July 1941 that all sheep were doing well. This flock was observed in January 1942 and all sheep were in very good condition. They were tested again in February 1942, and at this time 11 ewes had produced 12 living lambs. Of the 11 ewes, one ram, and five yearling ewes, there were 10 reactors.

TABLE I.

INTRADERMIC JOHNIN TEST ON SHEEP FLOCKS* 1941.

Flock number	Number tested	Number reacting
1	5	1
2	5	5
3	66	42
4	221	97
5	19	14
6	48	17
7	73	21
8	10	3
9	49	19
10	2	1
11	36	18
12	20	8
13	36	20
14	32	15
15	79	49
	701	330

47% reactors.

* Flock No. 8 was composed of 51 sheep, 10 typical sheep and lambs were tested. Flock No. 2 (5 sheep) were added to flock No. 3 by purchase.

Testing in 1940 indicated that many sheep reacted to the intradermic johnin test. Following the demonstration of organisms indistinguishable from *M. paratuberculosis* in several cattle and sheep dying with symptoms associated with Johne's disease the necessity for a diagnostic agent was established. Retesting 78 positive sheep showed that 74 again reacted. It was thus established that the intradermic johnin test has a high degree of reproducibility. Several flock owners disposed of their reactors which prevented re-

Fig. 8. A large discrete swelling following the injection of johnin

peated tests on many of the same individuals.

The number of sheep tested and reacting to the intradermic johnin test in various flocks is given in Table I. Lambs and mature sheep are considered together in this table.

The intradermic johnin test as applied to sheep is essentially the same as for cattle. The caudal fold or the vulva appear to be the best site for the injection. Sheep that are docked very close sometimes have no caudal fold. Such sheep can be injected near the anal ring or in the vulva. Tests read at 24 or 48 hours often have not attained the full size that they show at 72 or 96 hours. Routine tests are read 72 hours after injection.

The interpretation of some reactions presents a difficult problem. The clearly negative test is shown by the complete disappearance of the swelling at the site of injection. If the area is carefully cleaned and care is used in making the test there is practically no evidence of the injection after a lapse of 24 hours.

Many sheep respond to the johnin with a swelling which may be either circumscribed or diffuse. The diffuse reactions are usually hot and painful, and they can often be determined by observation alone. Illustrations of the various types of reactions are shown in Figs. 5 to 9 inclusive.

The most difficult type of reaction to evaluate is the slight thickening of the dermis which may contain a very small circumscribed nodule of 2 to 3mm in diameter. In several cases these very mild reactions have been observed in clinical cases of Johne's disease.

By necropsy and the examination of intestinal smears for acidfast bacilli in 24 reacting sheep it has been possible to find organisms indistinguishable from *M. paratuberculosis* in 15 cases. The intradermic johnin test will not detect all animals harboring acidfast organisms in the intestinal mucosa. In two cases from seven non-reacting sheep from infected flocks it was possible to demonstrate acidfast organisms in intestinal smears.

The discrepancy between the reaction to johnin and the demonstration of acidfast organisms in intestinal smears can in part be explained by the fact that not enough portions of the intestinal tract were examined. The finding of acidfast organisms

Fig. 7. Diffuse swelling following intradermic injection of johnin

in tissue smears of non-reacting sheep offers the more serious problem in evaluating the test. This may be due to recent infection or to failure to interpret accurately the reaction of the tissue to the johnin. In some cases the tissue response to the antigen is very slight. It is now recommended that a retest be made after a lapse of 40 to 60 days.

It has been impossible to obtain very definite information on the economic sig-

Fig. 8. A large circumscribed swelling following the injection of johnin. This picture was taken 120 hours after the injection

nificance of ovine Johne's disease. In flocks where both reactor and non-reactor animals have been maintained the wool production and lamb production have been nearly identical in the two groups. There are so many other factors which contribute to the whole general picture that the segregation of the whole into various elements is difficult. Most of the flocks under observation have been composed of several different breeds. The incidence and effects of other diseases also play an important role. In many flocks of sheep the effects of parasitism have been as severe as any possible effect of Johne's disease. These observations are in agreement with those of Dunkin and Balfour-Jones.[7]

McEwen's experiments indicate that sheep past the age of two years do not readily contract Johne's disease. This point has not been determined by carefully controlled experiments, but sheep of 5 to 6 years of age have become reactors to johnin during the past two years. The circumstantial evidence suggests that in certain individuals the "age immunity" may not develop. It is also possible that certain of these sheep were infected at the time of the early tests and failed to react.

The wide distribution of Johne's disease that seems apparent from preliminary surveys immediately raises the question of instituting control measures for handling this disease. At the present time there does not appear to be a satisfactory plan of procedure. The test and slaughter method would possibly be successful on carefully selected farms, but with this disease all species must be considered and the plan must be applied to the control of all livestock. There is a strong feeling among livestock men that after Johne's disease has become established the number of clinical cases will be low.

It is a common observation in nearly all flocks that good care, proper feeding, and the control of parasites has decidedly decreased mortality. There seem, however, to be irreducible losses with symptoms of

Fig. 9. A small discrete swelling following the injection of johnin

clinical Johne's disease. Although these losses are only 5%, as suggested by McEwen, they still constitute a serious drain on the sheep producer.

Control Measures

Clinical symptoms of Johne's disease are not common in flocks which are adequately fed and in which the internal parasites are controlled by medication and pasture rotation. In nearly all cases where symptoms ascribed to Johne's disease have been ob-

[7] Dunkin, G. W., and S. E. B. Balfour-Jones, 1935. A disease of sheep simulating Johne's disease. *Jnl. Comp. Path. and Therap.* 48, p. 236.

served there has been a moderate to heavy infestation with some type of gastro-intestinal parasite. No medicinal treatment has been found effective in treating clinical Johne's disease.

Interspecies transmission of Johne's disease appears to take place when the animals are pastured in the same lots. On one farm where the same lots were used by cattle, sheep, and swine it was found that individuals of all three species reacted to the intradermic johnin test and acidfast organisms have been demonstrated in the intestinal mucosa of all three. A high percentage of horses and mules tested have shown positive reactions to johnin. In one case a reacting mule was killed for examination but acidfast organisms were not demonstrated.

Preliminary studies on porcine Johne's disease have indicated that the usual symptoms of Johne's disease rarely if ever develop in the pig. Numerous "reactor" swine have been examined post mortem and acidfast organisms have been demonstrated in the intestinal mucosa. The animals examined have never presented evidence of avian tuberculosis. At the present time we are inclined to regard Johne's disease infected swine as possible dangerous carriers of the disease. It may be that swine suffering from heavy parasitism or malnutrition would also develop clinical Johne's disease, although it has not been observed in this laboratory.

The problem of Johne's disease control in the future is one of considerable importance. The test and slaughter method is economically unsound in many flocks. The incidence of the disease often exceeds 75 per cent of the breeding flock. Since suckling lambs react to the johnin test it seems that a test and segregation plan would not be feasible. This applies particularly to those flocks maintained in crowded quarters. A larger flock was kept under semi-range conditions and found to have very few reacting lambs in both 1940 and 1941 crops. There is the possibility of eradication of the disease under such conditions. The small farm flock, however, does not appear to lend itself to such a plan of control.

In testing lambs with johnin it has been found that animals of five months old frequently react. In Fig. 10 is shown a five month reactor lamb killed for examination.

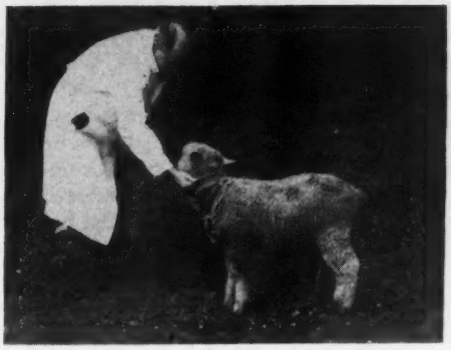

Fig. 10. A reactor lamb of five months of age

A limited number of acidfast organisms could be demonstrated in intestinal smears.

Summary

1. A high percentage of sheep have been found to react to the intradermic johnin test.

2. It has been possible to demonstrate acidfast organisms in the intestinal mucosa of 15 of 24 reacting sheep.

3. It is sometimes possible to demonstrate acidfast organisms in the intestinal mucosa of sheep that failed to react to johnin.

4. The interrelationship between the symptoms of ovine Johne's disease and parasitism is discussed.

5. The possibility of interspecies transmission of Johne's disease is considered.

The authors wish to express their appreciation to Dr. B. T. Simms, Dr. H. W. Johnson, Dr. J. G. Milligan, and Mr. B. F. Cox of the Regional Laboratory Animal Disease Research for furnishing the johnin used in these tests and for assistance in testing and examining specimens submitted to the laboratory. Also to Dr. J. L. Reineccius of the Bureau of Animal Industry and to Dr. G. T. Railsback of Batesville, Arkansas for assistance in various field tests.

The authors also wish to acknowledge the cooperation of the various flock owners who have contributed freely of their time and animals for this investigation.

The Effect of Phenothiazine on the Hemoglobin Concentration of Chickens*

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The State College of Washington
Pullman, Washington

IN a recent paper, Meriweather[1] concluded that, "Phenothiazine, when administered to chickens, caused a drop in the hemoglobin amounting to approximately 2gm per 100cc of blood. This decrease was most noticeable 48 hours after administration, after which a gradual rise in hemoglobin content occurred."

The effect of therapeutic doses of phenothiazine on fowl is of practical importance. Phenothiazine is the most efficacious anthelmintic thus far reported[2] against the cecal worm, *Heterakis gallinae*, and the control of this parasite is essential to profitable turkey and poultry raising in those regions where enterohepatitis is a common disease.

If the administration of therapeutic amounts of phenothiazine to fowl causes a marked decrease in the hemoglobin concentration of the blood, it is reasonable to assume that this drug is deleterious. Repeated doses, such as are indicated when birds are maintained on contaminated areas, would probably be sufficiently harmful to be of real economic significance. The recommendation of the drug as an anthelmintic against *H. gallinae* should, in that event, be delayed until the nature of the anemia and its effect upon the bird has been investigated.

However, if the hemoglobin concentrations of the blood of the birds studied by Meriweather declined from reasons other than the effect of the phenothiazine, and therapeutic amounts of phenothiazine do not significantly depress the hemoglobin the error should be corrected in the literature.

There is ample reason to suspect that phenothiazine therapy might decrease the hemoglobin content of chickens. De Eds, Stockton and Thomas[3], who administered phenothiazine to human patients suffering from urinary tract infections, state in their summary, "Phenothiazine is capable of producing secondary anemia when the drug is used continuously in excessive or extra therapeutic doses. The experimental evidence indicates that this side action is similar to that produced by methylene blue." They observed anemia in only three of 49 patients and these had received an average dose of 23.3gm, which they state was far beyond the average dose. According to their observations the anemia was apparently hemolytic in nature, since there was an early reticulocyte response and a rapid regeneration of the blood, which would not have occurred had there been injury to the bone marrow.

Errington[4] made erythrocyte counts of 39 horses before and following the administration of phenothiazine and found that decreases of one million or more erythrocytes per cmm. occurred in 28 of these animals. One stallion was made distinctly ill, developed icterus and presented evidence of nephritis. The erythrocyte count of this animal dropped from 8,690,000 per cmm. before treatment, to 3,810,000 per cmm. on the twenty-second day. By the thirty-third day the erythrocytes had increased to 4,500,000 per cmm. Another

* From the Division of Veterinary Science. Published as Scientific Paper No. 520, College of Agriculture and Agricultural Experiment Station, State College of Washington.

[1] Meriweather, Bert, 1941. Phenothiazine vs. hemoglobin. *Vet. Med.* 36, pp. 374-375.

[2] McCulloch, Ernest C., and Lyle G. Nicholson, 1940. Phenothiazine for the removal of *Heterakis gallinae* from chickens. *Vet. Med.* 35, pp. 398-400.

[3] De Eds, Floyd, A. B. Stockton, and John O. Thomas, 1939. Studies of phenothiazine VIII. Antiseptic value of phenothiazine in urinary tract infections. *Jnl. Pharm. and Exper. Therap.* 65, pp. 353-373.

[4] Errington, B. J., 1941. Phenothiazine as an equine anthelmintic. *Vet. Med.* 36, pp. 188-193.

stallion receiving phenothiazine from the same source also was made ill and the erythrocyte count dropped from 9,075,000 to 8,260,000 per cmm.

Two other stallions which received phenothiazine from another source were not made ill nor were there any significant changes in their erythrocyte counts.

Schmidt, Christian and Smotherman[5] describe deaths of horses and colts following the administration of theraputic doses of phenothiazine. They point out that some factor, as yet undescribed, may be responsible for greatly increased toxicity of some lots of phenothiazine or for some groups of animals being unusually susceptible to phenothiazine poisoning.

The data presented by Meriweather is somewhat difficult to interpret because of the lack of controls and the absence of any correlation between the amount of phenothiazine administered and the degree of oligochromemia that followed. This is especially puzzling since the dosages varied from 0.5gm to 5gm, or from the maximum amount we have recommended for chickens to ten times as much.

Quite similar decreases in hemoglobin values have usually occurred when we have first confined and handled farm flock birds. In most instances the hemoglobin values have returned to normal within a few days. Also, we have observed simultaneous increases and decreases in the hemoglobin concentrations of considerable numbers of birds confined in different pens. This may be correlated with the temperature and the relative humidity of the environment.

We have been unable to detect any deleterious effect on chickens from the administration of therapeutic doses of phenothiazine[2]. In view of the contradictory results obtained by Meriweather, it was felt desirable that both his and our experimental technic and data be subjected to reexamination.

TABLE I.—HEMOGLOBIN VALUES OF FARM FLOCK HENS CONFINED BUT RECEIVING NO MEDICATION

Dates		8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/29	8/30
		Grams Hemoglobin per 100 cc.								
Hen No.	1	11.22	10.13	9.35	8.80	9.90	8.36	10.01	10.10	10.27
	2	12.43	11.22	11.88	10.67	9.24	10.01	11.30	11.20	11.08
	3	11.00	8.91	10.01	11.66	8.36	8.80	9.47	8.96	9.41
	4	12.43	10.34	11.66	9.46	9.24	9.35	9.42	11.23	11.46
	5	12.54	10.01	10.78	9.68	9.90	9.35	10.30	10.57	11.66
Average		11.92	10.12	10.74	10.05	9.33	9.17	10.10	10.41	10.78

Experimental

The technic used for hemoblogin determination was as follows: A 0.02cc sample of blood was drawn from the brachial vein of each bird and diluted in 8cc of N/10 HCl to make a dilution of 1:400. Each diluted sample was allowed to stand at least two hours to insure complete hemolysis; then at the time the determinations were made, each sample was agitated thoroughly to produce a uniform solution. The samples were read in a Klett top-reading colorimeter against a Newcomer glass standard hemoglobin disc. The hemoglobin

[5] Schmidt, H., T. T. Christian, and W. M. Smotherman, 1941. Is phenothiazine poisonous to horses? *J.A.V.M.A.* 99, pp. 225-228.

TABLE II.—HEMOGLOBIN VALUES OF NON-MEDICATED FLOCK REARED, NON-MEDICATED BATTERY REARED HENS AND BATTERY REARED HENS RECEIVING ONE GRAM PHENOTHIAZINE

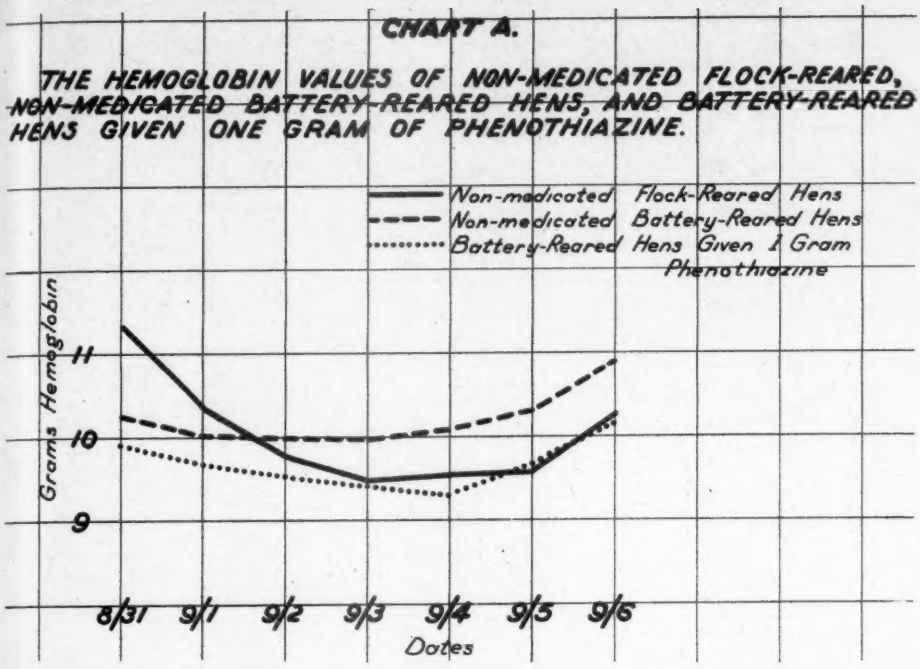
	Dates		8/31	9/1	9/2	9/3	9/4	9/5	9/6
Source	Medication	Bird No.	Hemoglobin Values, Gm. per 100 cc.						
Farm Flock Reared	None	1	12.32	10.01	8.80	8.91	9.02	8.36	10.67
		2	10.67	11.22	8.80	9.79	9.46	10.01	9.02
		3	11.33	9.13	10.12	10.12	9.24	8.54	10.30
		4	10.34	11.22	11.33	9.79	10.00	10.23	11.22
		5	12.00	10.00	9.79	8.69	9.90	10.89	10.23
		Average	11.33	10.32	9.77	9.46	9.53	9.60	10.29
Individual Cage Battery Reared	None	262	10.23	10.00	9.57	10.34	9.90	11.11	10.67
		251	8.58	8.91	8.58	9.02	9.13	10.34	11.55
		252	10.21	10.20	9.68	9.02	8.85	9.02	9.90
		279	12.00	9.90	10.89	10.56	12.10	10.23	12.20
		217	10.23	11.22	11.10	10.78	10.45	10.78	10.00
		Average	10.25	10.05	9.97	9.94	10.08	10.30	10.35
Individual Cage Battery Reared	1 gram Phenothiazine 8/31	247	10.34	8.69	9.79	9.13	9.68	10.45	10.00
		261	10.23	10.56	10.12	9.57	9.02	10.23	10.34
		260	9.11	9.17	9.90	8.98	8.69	8.69	8.91
		312	9.68	10.34	8.69	9.68	9.02	8.58	10.56
		263	10.12	9.68	9.24	9.79	10.12	10.23	10.87
		Average	9.90	9.69	9.55	9.43	9.31	9.64	10.14

values were not corrected by the procedure described by Dukes and Schwartz[6].

Five hens, 441 days of age and apparently in normal health, were caught from a local commercial flock at 8:30 A.M. on August 20 and bled approximately one-half hour later and daily thereafter at 9 A.M. These birds were confined in individual compartments in a laying battery with water and feed before them at all times but received no medication. The daily hemoglobin readings of these birds are shown in Table I. The hemoglobin values of one bird declined from 11.0 to 8.36, while the average decrease was from 11.90 to 9.17, which is approximately the decrease Meriweather observed in the birds he treated with 5.0gm of phenothiazine. It is possible that the high concentrations of hemoglobin observed in blood drawn shortly after catching may have been the result of excitement.

The experiment was repeated, this time with five farm flock birds and five birds that had been reared in individual compartments in a laying battery. The farm flock birds were 172 days old when caught on August 31 and placed in the laying battery and the battery-reared birds were approximately 16 months old. Neither group received any medication during the

[6] Dukes, H. H., and L. H. Schwartz, 1931. The hemoglobin content of the blood of fowls. *Amer. Jnl. Physiol.* 96, pp. 89-93.



experiment. In addition, five battery-reared birds were given 1gm of phenothiazine.* The daily hemoglobin readings of the birds in these groups are shown in Table II and Chart A. It is obvious that the change in environment, together with handling, had more effect upon the hemoglobin values of the farm flock reared birds than did the administration of 1gm of phenothiazine to the birds reared in individual compartments in a laying battery and which remained in a familiar environment.

We next attempted to duplicate Meriweather's experiment, as described in his paper. In our experiment, five birds were included in each group. Five birds each received a single dose of 0.5gm phenothiazine; five received 1gm; five received 2.5gm and five received 5gm. In addition, five birds received no medication and served as controls. The results of this trial are included in Table III and fail to show a correlation between phenothiazine medication and oligochromemia. As compared with the controls, the average hemoglobin concentration of the treated birds was 0.11gm higher at the time of medication and 0.28gm lower the next day. On successive days thereafter, it was 0.04gm higher, 0.37gm, 0.07gm and 0.10gm lower. These birds all had been reared under experimental conditions and were accustomed to individual cages and handling.

Discussion

As soon as any drug is newly recommended for any therapeutic purpose, it is the duty of all investigators to check the original experiments and to ascertain whether they obtain the same therapeutic response. Different lots of the drug, different types of animals and different environments may influence the results. It also is essential that all workers search for undesirable effects and report them as soon as observed in order to check any over-enthusiastic acceptance of a drug in those instances where it is not indicated. Such checking can be based both upon

* The phenothiazine used in these trials was furnished by E. I. du Pont de Nemours and Company.

TABLE III.—AVERAGE HEMOGLOBIN VALUES OF BATTERY REARED BIRDS RECEIVING PHENOTHIAZINE

Medication 9/8		9/8	9/9	9/10	9/11	9/12	9/13
		Average Hemoglobin Values, Gm. per 100 cc.					
Phenothiazine	0.5 Gm.	10.63	10.12	9.98	10.04	10.59	10.71
	1.0 Gm.	10.47	10.31	10.52	10.47	10.60	11.00
	2.5 Gm.	10.50	10.21	10.78	10.39	10.70	10.56
	5.0 Gm.	10.46	10.19	9.78	9.87	10.53	10.22
	Average	10.51	10.21	10.25	10.19	10.60	10.62
Non-Medicated (Controls)		10.40	10.49	10.21	10.36	10.53	10.72

clinical observations and upon closely controlled experiments. Care should be taken, however, to avoid drawing too positive conclusions from limited numbers of clinical observations or uncontrolled experiments.

The data obtained from these trials indicate that the catching and confinement of flock reared birds has a greater influence upon the hemoglobin concentration of the blood than does phenothiazine.

Summary

The administration to chickens of the therapeutic dose of phenothiazine and twice, five and ten times this amount did not significantly lower the hemoglobin concentration of the blood.

The South Dakota experiment station finds that dressed poultry which had been fed wheat and corn are fatter and their breasts fleshier than those which had been given barley. They suggest that in grading, the size of the breast and the quality of meat should be noted.

* * * *

The best pullets are those that mature early. The mortality, over a period of 10 months, of early maturing birds was 14.29%, as compared to 34.43% deaths in late maturing fowl. It is not advisable, reports the New Jersey experiment station, to keep these late maturing pullets, as their egg production is low.

* * * *

The quality of fish meals has improved steadily in the last decade. The methods of applying heat during the drying process and the effect of heat on protein quality have been studied. The need for the immediate drying of fish scrap in order to avoid any decomposition has also been thoroughly established. Fish meals are now quite uniform within each of the several types and sources that are available. In this field also, a determination of riboflavin content helps in judging the relative quality of the product. The moisture, protein, and mineral content should not be overlooked.—*National Poultry Digest.*

* * * *

Poultry experts at the Wisconsin Experiment Station have found that fresh meat can be fed to laying flocks during the winter months with excellent results. The meat may consist of rabbits, muskrats caught for their fur, calves too poor to raise, worn-out horses, or any farm animal that has died from accident, injury, or any other cause except one of the communicable diseases.

* * * *

The New Jersey experiment station finds that when immature or soft corn is fed to chickens it may cause serious trouble, since chicks are susceptible to mold infection. Poultry breeders are advised to see that corn cobs which are to be ground for litter are properly dried, as the mold which may form on them affects the respiratory organs.

A Note on the Probability of Error in the Diagnosis of Rabies by Microscopic Search for Negri Bodies*

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and T. F. SELLERS, M.D., Georgia State Department of Public Health
Atlanta, Georgia

THE microscopic diagnosis of rabies is accomplished by different workers in various ways; some prefer to look for Negri bodies in paraffin sections, some choose to make impressions, and others make smear preparations. Of the variety of methods the microscopic examination of smears or impressions made from Ammon's horn probably holds pride of place by virtue of its simplicity and the rapidity with which it can be performed. In any case, however, it is probable that a certain number of errors in diagnosis occur due to failure to demonstrate the characteristic intracytoplasmic inclusion bodies in the nerve cells.

Negri-Luzzani[1] reported the results of a study of 4,961 brain specimens by microscopic examination checked by animal inoculation; a total of 3,058 were positive by microscopic examination, but 6.7% of the microscopically negative specimens were also found positive on animal inoculation. Koch and Jahn[2] reported a similar study of specimens received at the Robert Koch Institute during the period 1913 to 1928. Of a total of 8,366 specimens examined, 4,682 were positive, and of those negative microscopically, 11.8% were positive when inoculated into animals. Leach[3] has also reported that of 1,032 brain specimens examined, 12% of those reported microscopically negative were positive on mouse inoculation. Commenting on the probability of such errors in diagnosis, Leach says, "the percentage of error will probably vary also with the prevalence of the disease in the geographic areas from which the material for diagnosis is obtained. In regions of high endemicity one might expect a high percentage of Negri negative specimens proving positive on animal inoculation."

When it is necessary to establish beyond question the diagnosis of rabies, animal inoculation is imperative. Until recently the guinea pig and rabbit have been considered the animals of choice for this purpose, but since the demonstration by Hoyt and Jungeblut[4] that the intracerebral injection of rabies virus into white mice produced typical and constant infection, the white mouse has become increasingly popular as a test animal.

The only comparative study of the guinea pig and mouse inoculation methods we have found in the literature is that of Willett and Sulkin.[5] These workers reported that of 25 specimens inoculated in parallel into mice and guinea pigs all were positive in the mice, while four were negative in the pigs. Perhaps this is too small a group to be statistically significant, but it does indicate that occasional positive specimens will be missed by guinea pig inoculation.

Experimental

With a view of testing particularly the accuracy of the foregoing statements as to errors in microscopic examinations, and of determining the actual percentage of error occurring in the routine diagnostic work in our laboratories, the results detailed here are reported. The sources of the material studied were the diagnostic laboratories of

* Reprinted from the October, 1941, issue of *Journal of Laboratory and Clinical Medicine.*

[1] Negri-Luzanni. Cited from Kolle, W., R. Kraus, and P. Uhlenhuth, 1929. Handbuch der Pathogenen Mikroorganismen.

[2] *Ibid.*

[3] Leach, C. N., 1938. Comparative methods of diagnosis of rabies in animals. *Am. Jnl. Public Health* 28, p. 162.

[4] Hoyt, A., and C. W. Jungeblut, 1930. Experimental rabies in white mice and attempted chemotherapy. *Jnl. Infect. Dis.* 74, p. 418.

[5] Willett, J. C., and G. E. Sulkin, 1939. A comparative study of the mouse and guinea pig inoculation methods in the diagnosis of rabies. *Am. Jnl. Pub. Health* 29, p. 921.

the State Department of Health of Alabama during the years 1937 to 1939, inclusive, and of the Georgia Department of Health during 1937.

In the routine procedure the animal heads were received in the laboratories, the brains were removed, and smears were made and examined in the usual fashion. Sellers'[6] stain was used to demonstrate the Negri bodies in both laboratories. After the smears had been prepared for direct microscopic examination, the remainder of the Ammon's horn was placed in pure glycerin and sent to the Rabies Laboratory for animal inoculation. Here white mice were injected intracerebrally with 0.03cc of a 1:10 aqueous suspension of the hippocampus after trituration with alundum and centrifugation to throw down coarse particles. Table I gives an analysis of the findings on 1,320 specimens from Alabama, and on 754 specimens from Georgia.

are found to be actually negative when injected into mice, is insignificant.

Table II shows the number and per cent of specimens reported microscopically negative but found positive on mouse inoculation, together with the number and per cent of specimens reported microscopically positive but found mouse negative in the Alabama laboratories from 1937 to 1939, inclusive, and in the Georgia laboratories during 1937.

From the figures given in Table II it will be noted that addition of the total microscopically negative specimens and microscopically positive specimens for each year gives a sum total somewhat different from the total number examined for that year, as given in Table I. The reason for this apparent discrepancy is that in Alabama in 1937, for example, there were actually only 404 specimens diagnosed as microscopically negative which when inoculated into mice

TABLE I.

NUMBER OF SPECIMENS AND RESULTS OF MICROSCOPIC EXAMINATION AND MOUSE INOCULATION IN ALABAMA FROM 1937 TO 1939 AND IN GEORGIA DURING 1937.

Laboratory	Specimens Examined	Micro. — Mouse —	Micro. + Mouse +	Micro. — Mouse +	Micro. + Mouse —	Micro. — Mouse ±	Micro. ± Mouse -	Micro. ± Mouse +	Micro. + Mouse ±
Alabama, 1937	527	353	111	51	5	2	4	1	0
Alabama, 1938	588	377	125	65	6	9	5	0	1
Alabama, 1939	205	167	22	11	0	2	2	0	1
Alabama, Total	1320	897	258	127	11	13	11	1	2
Georgia, 1937	754	445	231	62	6	5	0	4	1

Table I also gives the total number of specimens examined microscopically and subsequently inoculated into mice, together with a complete breakdown of the findings by both methods of diagnosis. Examination of the table brings out two particularly significant points: first, that in both Alabama and Georgia a significant number of specimens are reported as microscopically negative, which are actually found positive when inoculated into mice; second, that the number of specimens reported positive on the basis of microscopic examination, which gave a definite positive or negative result. In other words, the seven specimens shown in Table I in which either the microscopic or mouse result was not clearcut, i.e., was doubtful, have been eliminated.

Discussion

It is probable that no single method of microscopic brain examination would yield 100% correct results in the diagnosis of rabies. From the findings presented here it appears that in the laboratories of the Alabama State Department of Health, over a three-year period, slightly over 12% of the specimens reported as negative, on the basis

[6] Sellers, T. F., 1927. A new method for staining Negri bodies of rabies. *Am. Jnl. Pub. Health* 17, p. 1080.

of microscopic examination of stained smears prepared from Ammon's horn, were in fact positive. During 1937 the microscopically negative mouse positive specimens constituted 12.6% of the total diagnosed microscopically negative in Alabama, and 12.2% of the total for the same year in Georgia.

It also appears that errors occur, but to a lesser extent, in the opposite direction. In Alabama, over the three-year period, just about 4% of the specimens diagnosed as microscopically postive were negative when injected into mice. In 1937 in Alabama the number of microscopically positive specimens found negative on inoculation was 4.1% of the total reported microscopically positive, while in Georgia it was 2.5%. However, these figures lose their apparent significance when the total number of specimens examined is considered.

An attempt at explanation of the above contradictions suggests speculation in several different directions: (1) the certainty with which Negri bodies are recognized by the examiners; (2) the failure to examine smear preparations carefully enough or to make them from the portion of the brain in which Negri bodies were present in sufficient numbers to be detected; (3) the presence in the dog population of strains of the virus which fail to elicit Negri body formation in the dog though capable of giving rise to the disease in mice; (4) the prevalence of distemper or other disease in the dog population which might give rise to inclusion bodies that could be mistaken for Negri bodies; (5) the failure to inject enough virus into the mice to cause rabies though Negri bodies were demonstrable in the original smears; (6) the viability of the virus when injected into mice due to its age or other factors.

Conclusions

1. In an area of high endemicity of rabies errors have been shown to occur in both directions in the microscopic diagnosis of the disease.

2. In Alabama it has been shown that over a three-year period an average of 12.4% of the specimens reported as microscopically negative were actually positive, as shown by mouse inoculation.

3. In Alabama in 1937 the percentage of specimens microscopically negative and found positive on mouse injection was 12.6, while in Georgia the percentage was 12.2 for the same year.

4. In Alabama in 1937 the percentage of microscopically positive specimens found negative on mouse injection was 4.1, while in Georgia it was 2.5.

5. It is not possible to attribute definitely the discrepancies noted above to any one cause.

TABLE II.

NUMBER AND PER CENT OF SPECIMENS MICROSCOPICALLY NEGATIVE FOUND MOUSE POSITIVE AND THE NUMBER AND PER CENT OF SPECIMENS MICROSCOPICALLY POSITIVE FOUND MOUSE NEGATIVE IN ALABAMA FROM 1937 TO 1939 AND IN GEORGIA DURING 1937.

Laboratory	Year	Micro. Negative			Micro. Positive		
		Total Specimens	Found Mouse Pos. Number	%	Total Specimens	Found Mouse Neg. Number	%
Alabama	1937	404	51	12.6	116	5	4.1
Alabama	1938	442	65	14.7	131	6	4.6
Alabama	1938	178	11	6.2	22	0	0.0
Alabama (Total)	1937–39	1024	127	12.4	269	11	4.1
Georgia	1937	507	62	12.2	237	6	2.5

Rabies Can Be Controlled

Rabies does not exist in Canada or in Great Britain. "That it is not controlled or eradicated in the United States is uncomplimentary," C. R. Schlotthauer declares.

Compulsory licensing and vaccination, impounding and destruction of all stray dogs, quarantine of all dogs during the presence of the disease in a community and of all dogs brought in at any time—all will aid in control and prevention of the disease.

Why This Loss?

By DON CHRISTIAN*
Manhattan, Kansas

DURING a recent vacation in southern Georgia it was my privilege to visit a meat packing establishment of considerable size. Most of the visit was spent with the B. A. I. veterinarians on post-mortem inspection of cattle and hogs. The great amount of loss of meat, especially pork, due to condemnations as a result of parasitism was almost unbelievable to me. The kidney worm of swine, *Stephanurus dentatus*, was responsible for a very large percentage of these losses.

Stephanurus dentatus

Kidney worm of swine. Entire worms, lateral view. Large illustration, female enlarged. Upper small illustration, male, natural size; middle, female, natural size. From Taylor

After seeing hundreds of livers and kidneys pass down the condemned chute and many pounds of muscle tissue and fat being trimmed from the loin region of hogs, I wondered why such waste could not be abolished, or at least greatly reduced. If food is to win the present war and write the peace, these thousands of pounds of potential food products, if conserved instead of condemned, should make that winning and writing easier for us all.

Below is represented approximately the average monthly loss in food and dollars occurring at this one establishment; varying, of course, with the number of hogs slaughtered. It portrays only the loss in one small section of the South during a relatively short time. Such controllable losses multiplied by months and miles would give a tremendously large figure. *S. dentatus* also causes the condemnation of a significant number of cattle livers, but this is slight when compared to the pork losses.

Condemnations consist not only of livers, kidneys, and small portions of meat and fat from the slaughtered hogs; often entire carcasses are lost for food because of extensive kidney-worm infestation, producing generalized icterus or pyemia in some cases. Following is a summary of the condemnations and losses sustained because of stephaniasis in hogs during the month of January, 1941, in the establishment which I visited:

CONDEMNED.

Total Kill	Whole Carcasses	Pounds Liver	Pounds Kidneys	Pounds Loins	Pounds Fat	Total Loss in Dollars
52,534	Pyemia: 42 Icterus: 16 Stephaniasis: 82	95,254	17,243	41,239	23,640	$14,139.15

■ The development and means of propagation of this parasite are not a mystery; its life cycle is understood as well as that of most parasites at the present day. Infested swine eliminate thousands of eggs in their urine daily. Twenty-four to 48 hours are required for the hatching of these eggs, moisture and shade favoring the process. The larvae become infective in four to six days and enter the body of the hog either by being swallowed in the feed or as a result of the animal's rooting in mud or litter; occasionally they penetrate the broken skin. The immature forms then enter the blood stream and may be carried to any organ of the body. The liver seems to be a favorite location; here most of the larvae begin their development.

*Kansas State College, Class of 1942.

When the worms are one-third to one-half grown they break through the liver capsule and wander about the abdominal cavity, frequently penetrating the loin muscles and perirenal fat. Only those which enter the kidney or puncture the ureters produce the eggs which are found in the urine. Approximately six months are required for the completion of this cycle.

■ Although drugs have no action upon the worm in the body tissues, controlled swine production can prevent the original infestation. Eradication of this parasite calls for destruction of the infective larvae; it is in this stage that the worm is least protected and least resistant. Veterinarians of the Bureau of Animal Industry have developed systems of swine sanitation which, if properly applied, would minimize the number of infested swine. The basis of such a system consists in locating the hog lots on grounds where the larvae and eggs will be exposed to the sun on dry soil. Providing a bare area at one end of the lot or pasture for the feeding troughs and shelter houses serves to destroy many of the infective forms. Infestation in young pigs may be greatly reduced by placing a creep and self-feeder in one corner of this bare strip. A separate feeding pen for the sows, with frequent removal of the manure, also accomplishes much; but, is not essential to the production of parasite-free hogs. The destruction of all weeds and forage along the fences, which provide moisture and shade for the parasites, will more than compensate for the labor involved. The long time necessary for maturing of the worms should be considered in a program for the control of *S. dentatus* where market hogs only are produced.

■ A program to educate the farmer concerning the life cycle and means of control of the kidney worm would go a long way in reducing this enormous food loss. The application of a strict system of control, would increase the value of those hogs twenty-five to fifty cents per cwt. Is it not advisable for a hog raiser to adopt such a method of production? And is it not the responsibility of the veterinarian to help the farmer solve this costly problem wherever possible?

Pointers for Pig Producers

Feeding tests recently conducted by E. F. Ferrin of the animal husbandry division of the Minnesota Agricultural College indicated that differences in feeding values of hybrid and open pollinated corn are due to variations in types of corn. Pigs given free choice at self-feeders consistently preferred a hybrid corn over the open pollinated strain whether the corn was shelled or ground.

Good Feeding Throughout Gestation Essential to Vigorous Pigs

If gilts are fed corn alone during the gestation period they farrow too many pigs weighing two pounds or less and too few weighing three pounds or more at birth. At 56 days of age the two-pound pigs averaged 20 pounds and the three-pound ones 27 pounds. Such were the findings of the experiment station at Purdue University in tests with 7,554 animals. The experiment showed that if a large proportion of pigs weighing three pounds or more are to be farrowed the gilts and sows must be fed balanced rations throughout the gestation.

A successful mixture is one bushel of ground or shelled corn, one bushel of whole or ground oats and five pounds of meat scrap, bone meal or tankage. A recommended feed is grain and good quality alfalfa hay or pasture plus four to six pounds of skimmilk daily. If oats are not available a ration of ear corn or other grain and one-third pound of meat scrap or bone meal per animal daily is fairly successful. In addition to the above rations the sows and gilts should have available, in a self feeder but not mixed with the grain, a mixture of ten pounds each of pulverized limestone and steamed bone meal, and one pound of salt. In another compartment an extra supply of salt should be accessible at all times.

In Wisconsin feeding experiments breeding gilts fed 15% ground alfalfa, even although given soybean meal or tankage, produced husky litters. Those fed only 5% alfalfa along with the tankage or soybean meal had too little milk to suckle their pigs which became thin (and many died) before weaning time.

Neoplasm of the Maxillary Sinus of the Horse*

By HARRIS W. HANTMAN, Waltham, Massachusetts

AN eight-year-old black percheron gelding was admitted to the veterinary hospital on August 15, 1941. The owner stated that the swelling on the left side of its face had come on over a period of about six weeks, and that the horse was losing weight rapidly and refused to eat.

Symptoms.—The left side of the animal's face was swollen (Fig. 1). There was a unilateral purulent discharge with a fetid odor characteristic of a necrophorus infection. The horse seemed depressed and held its head down. The cheek teeth (the 4th and 5th) were loose. The animal drank cold water judiciously and refused grain. On examining the teeth and gumline with a light and dental speculum, we found the gums swollen and markedly congested. The area under the first molar, however, showed the gum retracted from the tooth.

Prognosis.—The owner was informed that there was little chance of the animal's complete recovery. Since it was serviceable, however, and since it seemed possible that we could aid the owner to realize another season's work from it, an attempt to alleviate the condition was made.

Treatment.—Removal of the loose teeth seemed advisable. Fortunately the crowns of these teeth were long enough to grasp with the molar extractor, and by rotating the handles of the instrument in a circular fashion they were removed. Since the nasal discharge was profuse, a trephine opening in the maxillary sinus (Fig. 2), was made in order to enable proper irrigation. The opening was made on an imaginary line from the medial canthus of the eye to the infraorbital foramen below the highest portion of the swelling. The bone was pierced easily and by digital exploration through the opening, an attempt was made to establish drainage. A fairly hard, roughened growth which bled mildly was encountered. A half-inch piece of gauze roller type bandage was inserted through the opening and through the alveolus of the upper jaw. A one-inch roll of bandage was fastened to the inside socket by tying the gauze drain to it and another to the outside trephine opening. The dressing was changed two days later, after flushing with a 2% potassium permanganate solution.

Fig. 1. Shows marked swelling of maxillary sinus on living animal

The gelding progressed nicely for one week, and although the discharge continued, it had abated markedly at the end of eight days. The final drain was removed after 11 days. The surgical wound healed nicely but the swelling on the left side remained the same. However, the right maxillary sinus began to swell also. In spite of this, the horse showed some willingness to eat grain.

Because the growth continued, the owner was informed of the hopelessness of the situation, and on September 2nd the horse was donated to our anatomy department.

* From the Department of Surgery and Medicine, School of Veterinary Medicine, Middlesex University.

Laboratory Findings. — The patient remained hospitalized, receiving palliative treatment and general care only. A blood analysis revealed the following:

BLOOD ANALYSIS

Red Cell count	2,860,000 per cu. mm.
White Cell Count	8,700 per cu. mm.
Hemoglobin	58%
Calcium Determination	13.7mg per 100 ml. serum

DIFFERENTIAL LEUCOCYTE COUNT

	No.	Per Cent
Neutrophiles		
Segmented	131	65.5
Unsegmented	26	13.0
Eosinophiles	2	1.0
Basophiles	1	0.5
Lymphocytes	29	14.5
Monocytes	11	5.5
	200	100.0

Microcytes were evident

A broth culture of the nasal discharge was made October 9th and examined October 11th. It appeared to have a heavy white powdery sedimentation of microorganisms. A gram stain revealed gram-negative bacilli, gram-negative streptococci, and gram-negative diplococci.

Post-Mortem Examination. — The horse died October 24th. A post-mortem examination included a detailed search for pathological changes and alterations in function. The main part of the tumor was lodged in the maxillary sinus. In appearance it was firm, hard and white, and on section showed little vascularity. It was atypically cylindrical in shape, with a rough, nodular surface which was more pronounced on its ventral side. It weighed approximately 2½ pounds and measured nine inches in length at its longest border (Fig. 3). The mucous membrane of the sinus was closely adherent to the surface of the tumor. Decayed food, lodged in the maxillary sinus after the removal of the 4th and 5th teeth, had caused a necrosis of the exposed parts of the tumor and mucous membranes.

The growth further invaded the lateral wall of the left nasal cavity and also the palatine part of the maxillary bone as far forward as the incisors. The latter were loose in their alveoli and could be removed

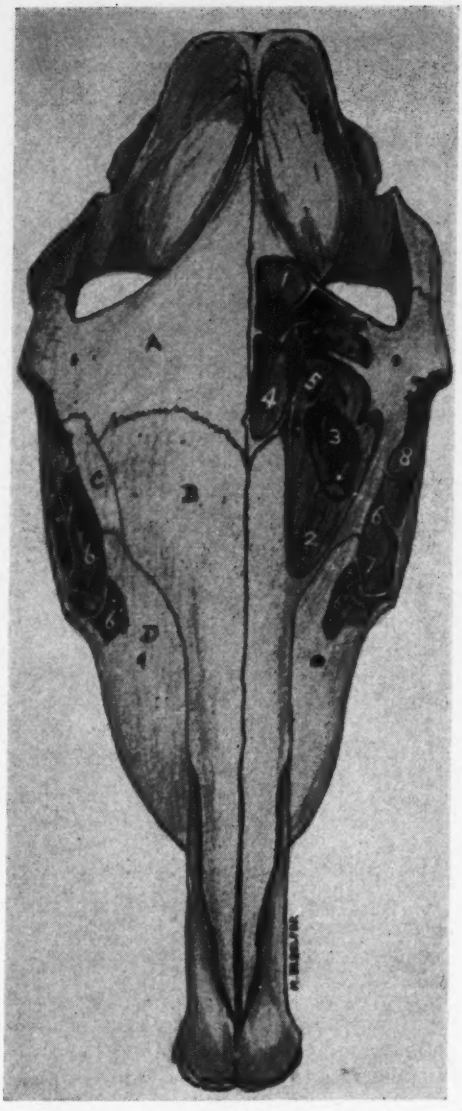

FIG. 2. SKULL OF YOUNG HORSE: DORSAL VIEW, WITH SINUSES OPENED UP

1, 2, Ends of Frontal sinus; 3, fronto-maxillary opening; 4, dorsal turbinate bone; 5, lateral mass of ethmoid bone; 6, 6', two compartments of maxillary sinus; 7, septum between 6 and 6'; 8, orbit; 9, anterior end of facial crest; A, frontal bone; B, nasal bone; C, lacrimal bone; D, maxilla. Adopted from Sisson

Fig. 3. Shows ventral view of neoplasm. Note dark area of necrosis

manually with very little traction. The posterior part of the tumor extended under the orbit but did not affect the eye nor the bone in that region. Abscesses and metastatic nodules were found in the left mandibular lymph glands, which were very much enlarged. No further metastases were found in the internal organs except for the spleen, which revealed a shrunken pulp with the trabeculae very distinct. None of the other organs showed any visible lesions.

The sectioned tissue disclosed an abundance of embryonic type of epithelial cells which were numerous. There was marked evidence of retrogressive changes and some portions of the growth made it difficult to identify as any special type of neoplasm.

The writer is indebted to Dr. C. E. Blye of the Department of Veterinary Pathology for his helpful criticisms and to E. Bond and E. Goldrosen, senior students, who helped with the post-mortem and laboratory findings.

Blood Transfusion in Animals

Direct Transfusion for Dogs.—At our animal hospital we keep a dog donor immune to distemper, encephalitis, and general infections, for the purpose of treating these conditions with direct blood transfusions. A simplified technic is used which necessitates no special equipment. By this method a therapeutic dose of blood can be transferred to a dog within two or three minutes.

Equipment.—(1) Local anesthetic; (2) 2cc glass syringe with 24-gauge half-inch needle attached; (3) 50cc glass syringe with 16-gauge one-inch needle attached; (4) one foot of rubber tubing for neck tourniquet.

Technic.—Sterilize equipment and apply rubber tourniquet tightly around donor's neck to distend the jugular veins. Shave the jugular region and inject 1cc of the local anesthetic into the skin directly over the vein, using the 2cc syringe. Attach the 16-gauge needle to the 50cc glass syringe and insert it into the vein through the anesthetized skin. Fill the syringe, remove the tourniquet, and withdraw the needle, still attached to the syringe. Give the blood at once to the recipient by subcutaneous injections, massaging well. Intraperitoneal injection is likewise satisfactory.

Indirect Transfusion for Large Animals.—Although the technic above described can be employed for blood transfusions in larger animals, it is usually preferable to use the indirect method in order that larger quantities of blood may be transferred.

Equipment.—(1) A number of 500cc serum bottles, each containing 50cc of sterile 2½% solution of sodium citrate; (2) five feet of rubber tubing for neck tourniquet; (3) two 12-gauge 1½-inch hypodermic needles; (4) two feet of rubber tubing with adapter attached for insertion into the hub of the hypodermic needles to carry blood from the vein to the serum bottle.

Technic.—Sterilize the equipment and apply the tourniquet tightly around the donor's neck to extend both the jugular veins. After properly restraining the donor, insert one of the 12-gauge needles through the skin into the jugular vein. Connect the adapter end of the rubber tube with the hub of the inserted needle and place the free end into the citrate solution in the serum bottle in such a manner that the flowing blood must come in contact with the citrate solution *before touching the sides of the bottle.* As the blood flows, rotate the bottle gently to mix thoroughly the blood and citrate. Fill as many bottles as are required. The citrated blood may then be administered to the recipient in the usual intravenous fashion, using the second 12-gauge needle since blood will probably clot in the first needle when the flow is discontinued.

J. J. ARNOLD

New Castle, Ind.

Effect of Artificial Radiation on Wound Healing

By H. J. MOSTYN, New York City

THE INFLUENCE of radiant energy on wound healing has been recently reviewed by Laurens and Arey. Many of the leading European heliotherapists, including Bernhard and Rollier, have extolled the merits of sunlight, both natural and artificial, and report marked benefit following its use, particularly in refractory wounds. Goldammer found that the results were brilliant in both fresh and granulating wounds received in battle. Coulter and Smith likewise think ultraviolet radiation of definite value in the treatment of wounds. Some workers, however, have found that healing is not hastened by artificial radiant energy. Coburn and Cowles not only failed to find any benefit on treating a large series of rats by irradiation with carbon and iron arcs, but their work seemed to indicate a retarding effect. Pollaczek found that doses slightly over optimal produced injurious effects. Sweeney, after a recent study with dogs, concludes that carbon arc irradiation, of the type and dosage used, has but little accelerating effect on the healing of clean wounds in the dog.

Adult healthy dogs of medium size (5 to 8kg) with pink skin and white or light colored coats were used. The wounds were made in pairs, one on each side of the body in the saddle region and were as identical as possible, the left wound being the experimental while the right served as the control. The wounds were of two sizes, 18 and 40mm in diameter (255 and 1256 sq.mm.) and of skin depth. They were made with sharp cork borers placed firmly on the skin and rotated. This method prevents reflex contraction and results in round wounds with well-defined margins. Because of their position the wounds remained clean without bandaging and the animals could not lick them.

The wounds were measured at intervals throughout the healing period by placing a clean glass plate over them and tracing the periphery with a sharp pointed glass pencil, transferring this to paper and determining the area with a planimeter. Healing was considered complete when the scab fell off or could easily be brushed off leaving a dry cicatrix beneath.

Irradiation was begun one to three days following operation. The dogs were placed in a hammock so adjusted under their bodies as to allow them to stand or to rest in the supports during the irradiation. The

Ultra-violet therapy is satisfactory to the dog

conditions were varied in different groups by varying the duration of the exposure, the number of exposures per week, the distances from the arc; by irradiating the whole left side of the dog or just the wound (local irradiation); by keeping some of the animals in complete darkness between

irradiations; and by not irradiating some at all.

The source of radiant energy was a carbon arc lamp burning "sunshine" carbons, operated at between 24 and 27 amperes and with a potential drop across the arc of 50 to 60 volts. The total energy emitted was 0.475 gram calories per square centimeter per minute at one meter distance, with a percentage distribution of ultraviolet 3, luminous 23.5, and infra-red 73.5.

Summary of 29 Small Wound Experiments

These can be divided into four groups. In the first three groups the whole side of the animal was irradiated with progressively increasing doses per group, while in the fourth group the exposure was limited to just the wound (local irradiation), the rest of the body being shielded from radiation. Since it seemed possible that the dogs might be obtaining sufficient radiation between exposures to influence the healing time of the wounds, particularly the controls, these were kept in complete darkness between treatments. In eight of the 29 experiments the irradiated wound healed more quickly and in eight less quickly than the control, while in 13 there was no difference. In only one experiment was the acceleration in healing rate marked.

Since the results on the small wounds were indecisive, an attempt was made, in the second series, to obtain more definite results by using a larger wound (1,256 sq.mm.) thus prolonging the healing time and allowing the radiant energy more time to manifest its effects.

Summary of Large Wound Experiments

Irradiation procedures similar to those for the small wounds were used. One group, however, was given more frequent but shorter irradiations to more nearly simulate natural radiation. In 10 of the 19 large wound experiments, the irradiated wound healed more quickly and in four less quickly than the control, while in five there was no difference. In two experiments there was a marked and in two there was a moderate acceleration, while in one there was a moderate retardation in the healing rate of the irradiated wound.

This chow dog, although kept indoors, doesn't lack for sunshine

The average healing time of the 10 non-irradiated small wounds was 28.1 days; of the 29 directly irradiated small (left) wounds, 20.9 days; and of the 29 indirectly irradiated small wounds 21.7 days. A similar comparison of all the large wounds shows an average healing time for the 14 non-irradiated wounds of 38 days; for the 19 directly irradiated wounds of 33.5 days; and for the 19 indirectly irradiated wounds of 35.8 days. This indicates a mild acceleration in the healing rate of the wounds in the irradiated dogs, the indirectly irradiated right wounds, which received only the general systemic effect, showing relatively less acceleration than those directly irradiated.

Autobiography of a Veterinary Practitioner

By E. T. BAKER, Moscow, Idaho

V. My First Job

A GAME of cards might be said to have determined my career. It came about in this manner: As private secretary of the Dean, I had access to all letters regarding jobs available to seniors. Two of the best opportunities were available at the Washington State College, in Pullman, and another was at the University of Arkansas, at Fayetteville. I had been through these sections, and liked them both, so it made little difference to me in which one I landed. In order to settle this problem, my room-mate and I played a game of "seven-up," with the winner to have his choice, and I won. Then, I drew a card to decide my future location. If the card happened to be a seven spot or under, I would go to Arkansas; if an eight spot or above, I would go to Washington. Carefully shuffling the cards, I drew the queen of hearts, and consequently my next 32 years were decided by the choice of a single card. I mention this again to show how "luck," or good fortune, or whatever one wants to call it, largely controls our destinies. Perhaps my early Presbyterian training of "what will be will be," has something to do with this feeling.

Several days after arriving at Pullman, Washington, which is about 75 miles south of Spokane, in a beautiful and fertile farming country, I was sent to take charge of the college exhibit at the Alaska-Yukon-Pacific World's Fair, which was held in Seattle during the summer of 1909. I stayed there until the fair closed in November. It was five months well spent. I was allowed all my expenses, with passes to everything in the grounds, and my hours were from ten to four.

Here, I met people from all over the world, and from every nook and cranny of the great Northwest, which was destined to be my future home. Best of all, I learned how to pronounce western words as they are commonly spoken. For example, Spokane is "spo-can" and not "spo-caine." Coeur d'Alene is pronounced "core dee lane," and Pend Oreille is called "ponder ray." Willamette is "will-lammit" instead of "willa-met," and Palouse is "puh-loose. Coyote is called "ky-oatie," and cayuse is pronounced "ky-use."

Of course, nowadays with extensive auto, train and airplane travel, this means less, but 30 years ago, few eastern people had been west of Chicago. Denver was considered "away out in the Rockies," while California was the final jumping off place. In those days it was a week's journey by train from New York City to San Francisco or Seattle. The west was just opening up, and the through trains were crowded.

In November, after the fair had closed, I returned to the college, and was stationed at Spokane, where the late Dr. S. B. Nelson, dean of the veterinary department, had established a branch hospital for the seniors. In those days, equine practice was enormous in the cities, and the chances for clinical instruction were considered superior to those in a small country town like Pullman. In this respect I saw a great change in my profession, much as I had

seen the printing trade turned upside down by the introduction of the linotype. Scarcely three years after my graduation I was to witness the rise of mechanized power and transportation in the form of autos, trucks, caterpillars and other motorized units.

From 1909 to 1913, the horse flourished

Deep snow is cleared from the roads promptly in the Northwest country. This proves helpful to the author

in the cities, and practitioners made money as fast as they could attend to calls. I knew several men who averaged around fifty dollars a day (yet one of these, after a lifetime of lucrative practice, had his burial expenses raised by his colleagues!)

One dray and moving firm had over 300 horses, and their monthly veterinary bill furnished a good income for one man. Fire horses, funeral outfits, driving and cab horses, laundry and delivery horses, all thronged the city streets in those days. In addition, dairy practice was beginning to become popular, and I made the first general tuberculin testing campaign around the city, finding some 800 reactors among 3000 animals. In those days, we used the thermal test, using 2cc of tuberculin injected subcutaneously in the neck. Temperatures were taken at 2, 5 and 9 p.m. The injection was made around 10 p.m., and the temperatures taken at 6, 8, 10 a.m., 12 M. and 2 p.m. the next day. It was a rather messy job, but I always liked that test because it brought out the reactors in accurate fashion. A cow suffering from the generalized type might not show much of a rise in temperature, but she did exhibit a profound physical reaction, and I became quite expert at detecting these symptoms. There was no such thing as a "suspect." Either an animal was passed or she was condemned. After an experience of some 30 years in testing, I think more grief has come from the many "suspects" than from anything else. This also applies to brucellosis. Not long ago, a farmer had three cows. One of these was a "suspect." In 60 days she was retested, and passed clean. Later on, he sold her to his brother-in-law, who had several small children. When she was tested again the next year, she gave a positive reaction. Such mix-ups cause more grief and distrust for the tests than anything else.

In those days we conducted tuberculin tests on a professional basis instead of running hither and thither as they now do, trying to make a record for numbers tested. We had to be methodical and careful in our work and know our stuff, as the following incident will illustrate: A state senator, a powerful political figure, owned a dairy farm, and he did not "believe in this here testing no how." He said it was all "hooey," but as I had played some baseball with his son, he allowed his herd to be tested, at the son's request. Out of some 50 purebred Holsteins half a dozen reacted, and the owner was quite "het up" about it. He put it up to me to make an

autopsy on the reactors at his farm in the presence of his family physician and himself. On all cases where no lesions could be found, I was to be stuck $100.

Fortunately, the first animal picked for autopsy showed as fine a bunch of tubercles and adhesions as I ever hope to see. There was even a large abscess in the liver, and whether it was tuberculous or not, it added to the general scene. The physician gave one hasty glance, and said to the owner, "that young veterinary must know his stuff.' Then they walked over to the barn, hitched up the team and buggy, and had the son drive them to the station. The other reactors were sent to a local packing house, and every one exhibited at least some lesions. That was how we learned to make tuberculin tests in those pioneer days. Perhaps, that is why I am always particular about my technic and reading the results.

Personally, I would not take this risk on tuberculin tests conducted by the intradermal method. There are too many "no lesion cases," and the "suspects" mean nothing at all in my young life. In those days we paid more attention to making the test and trying to interpret it than in making our reports. We had to be sure of our ground, or take the consequences.

I was fortunate in working with an experienced practitioner, and I learned many things from him not taught in textbooks or in college. I learned something of how to handle clients, and what constituted a reasonable fee. I also became adept at sympathizing with some bereaved woman whose little flea hound had recently joined other pooches in a shadowy land where hamburger grows on bushes, and there is a tree in every yard. Having charge of the small animal clinic for two years gave me such a dislike for this kind of work that I have never appreciated the beauties of an exclusive small animal practice. I like dogs and cats, and handle them without any trouble, but the less said about most owners the better.

I was supposed to teach a few classes, but this type of work was rather desultory. In addition to being dean of the college, Doctor Nelson was also state veterinarian, and a politician of the first rank. I picked up a few of the fundamentals of politics from him, but never put many of them into practice. From my newspaper experience, and from my state work, I saw very little in the political field except grief and a little ephemeral glory. Why a prosperous farmer wants to dabble into county or state politics and lose everything but his shirt is one of life's mysteries.

In time Doctor Nelson began sending me out on state calls, involving the investigation of outbreaks such as glanders, tuberculosis, goiter, abortion, rabies, red water, salmon poisoning and a number of other diseases. This was splendid training, acquainting me not only with all these diseases but with practically every practitioner in the state. I found them, on the whole, to be a fine body of professional men, full of genuine western hospitality and friendliness. On my part, I tried to be as ethical as I knew how, and worked with instead of against the local man. When I was called to a section where a competent graduate was located, the first thing I did was to contact him, and find out the lay of the land. If possible, I would have him go along with me, while I acted more as an outside consultant. This had a tendency to smooth out any local friction, and to increase the practitioner's prestige in his community. In return, he would show me every courtesy, and I learned a great deal in this way.

Senior students could be given a course in "getting along with older men" to the advantage of the entire profession. We need both youth and age in our battle against animal diseases, and the optimism of the one combined with the experience of the other makes a good combination. I am sorry to say kindness and consideration for others is often lacking, and much trouble is engendered thereby.

If we all would conform more to the precepts of the Golden Rule this would be a much happier world.

(To be continued)

Diphyllobothrium Latum Found

A black and tan male collie, four months of age, was presented at the veterinary clinic of Kansas State College September 22, 1941. The owner had noticed that the dog passed tapeworm segments and "scooted along on its rear."

The animal was thin, and its hair coat was rough, dry and harsh. Proglottids of *Dipylidium caninum* were found in its feces.

The cestodes were removed by means of gastrointestinal lavage, using a 1% hydrogen peroxide solution at body temperature.[1]

Twelve tapeworms were expelled, of which seven were *D. caninum* and five were *Diphyllobothrium latum*. The scolex was present on each of these tapeworms. The *D. caninum* averaged 12 inches in length. The average length of the *D. latum* was 34 inches.

While *D. caninum* is commonly found in dogs in Kansas, the cestode *D. latum* has not been reported previously from dogs in this state.

In the life cycle of *D. latum*,[2] the eggs are laid rather than passed in gravid segments; hence a careful microscopical examination of the feces must be made if this parasite is to be detected. If the eggs reach fresh water, a ciliated embryo develops and the eggs hatch in ten days to two weeks. The free-swimming embryo (coracidium) must be ingested within a few hours by a waterflea (*Cyclops* sp. or *Diaptomus* sp.), in which it develops into the procercoid stage. If the waterflea is eaten by any of several species of fresh water fish, the plerocercoid stage develops in the tissues of the fish. The adult tapeworm develops in a mammalian host, which has eaten raw or insufficiently cooked fish infected with the plerocercoid stage.

In view of this life cycle, it will be seen that it would be possible for this parasite to become established in Kansas. An effort was made to determine where the dog acquired the infection. It was learned from the owner that the animal was a household pet and had never been out of the immediate neighborhood. It had never been fed fish; but it was often allowed to roam outdoors, and might have picked up fish scraps in the neighborhood. The fish might have come from the ponds and streams near Manhattan; however, it is possible that they were brought in from areas where this parasite is known to be endemic, especially the Great Lakes region of Canada and the United States.[3]

While primarily a parasite of man, this tapeworm can also develop in a wide variety of fish-eating carnivores.[4] Hence it is difficult to control once it becomes established in any region.

Whatever the source of the infection described here, the presence of this cestode in Riley County, Kansas, represents a possible public health problem.

ARTHUR A. CASE, K.S.C. '42
Manhattan Kans.

[1] Whitney, L. F., 1939. Hydrogen peroxide as a general anthelmintic for dogs. *Vet. Med.* 34:9, pp. 560-566. Dr. E. J. Frick, of Kansas State College, has found this method highly efficient in the removal of tapeworms from dogs.

[2] Faust, E. C., 1939. *Human Helminthology* (Lee & Febiger, Philadelphia, 2nd ed.).

[3] Vergeer, Teunis, 1928. Dissemination of the broad tapeworm by wild carnivores. *Canad. Med. Ass. Jnl.* 19, pp. 692-694.

[4] Vergeer, Teunis, 1930. Causes underlying the increased incidence of the broad tapeworm in man in North America. *J.A.V.M.A.* 95, pp. 1579-1581.

Simple Treatment for Acetonemia

It is my opinion that where cattle in dairies are fed acid treated ensilage there is a larger number of acetonemia cases than where molasses treated ensilage is used. I believe that the acid tends to lower the calcium and sugar content of the blood.

I treat from fifty to a hundred cases a year and I verify my diagnosis with urine test. The treatment I use is simple. I inject 250cc vial of sterile dextrose into vein, I give 6 dram doses of chloral hydrate in a pint of water by drenching. Usually 6 doses, each dose five hours apart. Then I have the animal given a pint of corn syrup in a little water by drenching 3 times a day for a few days. With this treatment at least 98% of the cases responded favorably and in those that fail to respond, there is another trouble, such as infection from retained afterbirth.

L. D. WHITAKER
Farmville, Va.

Why Perform Necropsies?

In a 17th century English veterinary textbook there was an article concerning the horse's head. It seems there was controversy as to the contents of the animal's skull. Some held there was nothing but space; others, that it contained a fluid similar to water. Some time later some ingenious person thought to cut open a horse's head and thus learned of its contents.

The value of a similar procedure was emphasized recently during a call to treat a colicky colt. After the animal had been treated the owner spoke of his concern about his sheep. He said that one of his ewes had died that morning with no previous symptom except lameness. "Was it some contagious disease, poisonous plant, parasites, or what? But I suppose you can't tell anything by looking at a dead sheep." The owner was prevailed upon to produce the carcass. Necropsy revealed torsion of the uterus, which contained twin lambs. It had revolved 180° on its longitudinal axis. The owner was relieved to find that his other sheep were not in danger.

A more difficult case was that of a three-year-old Holstein bull with a history that it had suddenly become lame in the right front leg. It was treated for sprain. About six weeks later the animal was again brought in. It had gradually lost weight and was still lame, in the hind legs now as well as in the front. The bull was placed in a box stall and a blood sample taken, but it died before an examination could be made or treatment given.

Necropsy revealed: (1) A large abscess in the right axillary region involving the pectoral muscles; (2) multiple abscesses throughout the body; (3) an occluding thrombus of the pulmonary artery at its origin from the heart, with some canalization present. (A thrombus at this point is very rare, the commoner location being the right atrioventricular valve.) The abscesses caused the symptoms noted but the thrombus was responsible for the death of the animal.

A 14-year-old percheron mare was suffering from a respiratory ailment which had come on the day before. She refused to eat and moved reluctantly. Examination showed a temperature of 103.6°F., respiration increased and abdominal in type. Upon auscultation of the left thoracic cavity, musical rales were heard. The right lung was sound. There was no nasal discharge. A tentative diagnosis of pneumonia was made, and the animal was treated accordingly. The next day it died. Post-mortem examination revealed a ruptured diaphragm through which a portion of the bowel protruded into the thoracic cavity. The rounded edges of the tear indicated that the rupture was an old one.

It is not the purpose of these reports to instruct on how to perform a necropsy, but rather to attempt to jar the minds of practitioners to recognize its merits. Walter J. Crocker said in his text on *Veterinary Post-Mortem Examination*: "The veterinarian performing autopsies unquestionably comes to a more thorough knowledge of the interpretations of symptoms, the efficiency and proper selection of remedies, and in general. becomes a better diagnostician and safer therapist. Autopsy itself affords a review of anatomy, stimulates deep thinking, logical reasoning power, and the development of a keen mind."

Necropsy may be disagreeable work at times, but it is always interesting and frequently revealing. In fact, it is often the only way by which to clear up a doubtful case. It is a source of satisfaction to the veterinarian as well as to the owner, and keeps the veterinarian from making irrational statements beforehand, which might cause embarrassment as a result of post-mortem findings.

JOHN E. ERICKSON

Clairton, Pa.

Sodium Iodide Fails in Actinomycosis

I have had practically 100% successful results from the use of sodium iodide intravenously for actinomycosis in cattle in all cases except where there was bone involvement. Usually two doses, and in a few cases in large animals, three doses have been required.

About three months ago I treated a Jersey cow. Following the two intravenous injections of sodium iodide, the tumors, which were of about the size of an egg, shrank for some time and almost disappeared. Then one of them grew to several times its original size and I am sure has pus in it. It seems to have little attachment to the surrounding tissues. It is just back of the angle of the jaw. Two more tumors have developed in the upper parotid region. I would like to know if there is any likelihood of further treatment being of avail. Should I lance the tumors and send a pus specimen and a tissue specimen to a laboratory before attempting further treatment, or what do you advise? I have been pretty bold in promising on the basis of my previous experience.—*F. H. B.*

Comment by E. T. B.: My experience with sodium iodide has been much like yours, but now and then I run across a case that refuses to respond. If it be practicable I suggest fattening and butchering. With such high prices for beef this is not very tough on the owner. I would have a specimen examined, and perhaps if it were a streptococcus infection, sulfanilamide might do some good, although I am not crazy about this drug as a cure-all.

Everted Bladder in a Cow

Eversion of the bladder in the bovine species is considered a rarity. Fleming states that this condition is of rare occurrence in the cow, and Williams makes a similar statement, adding, however, that prolapse of the bladder does occasionally occur due to rupture in the floor of the vagina.

The evening of December 13, 1941. Dr. H. B. Liebengood of Bremen, Indiana, was called to a farm near Bremen. The patient was a four-year-old registered Guernsey cow which had calved the night before. The herdsman had noticed an eversion that morning. The herdsman, thinking the condition only an attempt to prolapse the uterus, waited until evening, at which time the bladder was considerably irritated and very edematous. The cow was straining and distressed. Fifteen cc of 1% procaine was given epidurally to relieve the straining. Using rubber gloves to protect the bladder from fingernails, the edema was reduced by gently compressing the bladder between the palms of the hands and rubbing and massaging with sugar over the area. Gradually the bladder was worked back through the urethra. As this process took about two hours of patient manipulation, the weight of the accumulating urine helped in drawing the last portion into place. Additional procaine was given as needed to maintain anesthesia. Then 500cc of 1-1000 acriflavine solution was administered intravenously. This was repeated the next day. No further straining occurred and recovery was complete and uneventful.

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Abstracts

Animals Under Tropical Conditions

The thermoregulatory mechanism functions differently in different homothermic species, but in all cases an inefficient mechanism results in the consumption of extra energy, with consequent detrimental effect on such factors as milk yield, meat production, or even resistance to disease. The various physiological processes involved are as follows:[16]

In large mammals, the metabolic thermoregulatory mechanism is employed in emergency only. Cold weather does not produce an increase of metabolic rate in well-fed animals. Ruminants cannot diminish internal combustion even in tropical sunshine, and nearly all large tropical mammals look for shade and sleep during the hot hours of the day. European cattle imported into the tropics frequently lose energy from the increase in metabolic rate which results from inefficient heat regulation and resultant fever.

The surface area of the lungs is estimated to be about 30 times that of the skin. Air leaving the lungs has a temperature of about 90° F and is saturated with water vapor. Every liter of water thus evaporated represents a loss of 580 calories and the bulk of the heat formed during and after heavy muscular work is eliminated in this manner. High air temperatures and increased humidity interfere seriously with muscular work, whereas efficiency is increased in dry atmospheres or at lower temperatures. As the rate of evaporation of water is greater at low barometric pressures, mountain air is physiologically drier than would be expected from the meteorological data. Small amounts of water are lost by evaporation from the skin.

In some species the sweat glands are found only in small localized areas of skin, but in the horse and the donkey they are spread over almost the whole surface. A skin rich in pigment protects the inner organs. In many tropical areas situated at sea level the air is so saturated with water vapor that evaporation by sweating does not take place. Sweat eliminates sodium chloride, so that this as well as water must be replaced. Adequate salt must be provided for horses working in the tropics. Certain horses fail to sweat when galloped under tropical conditions and may die of heat stroke when put into training. It is possible that their salt metabolism is in some way affected. Such animals are termed "dry sweaters."

In addition to the various processes described, special habits and adaptations can be regarded as subsidiary means of controlling body temperature and should be studied by the animal breeder.

[16] Kestner, O., 1940. Heat regulation in animals with special reference to tropical conditions. *Vet. Rec.* 52, pp. 74-76. Abst. in *Vet. Bul.*

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Raw Liver for Anemia in Horses

Four three-year-old ponies, weak from anemia due to a heavy infestation of strongyles, were given oil of chenopodium, then daily a mixture of iron sulphate, copper sulphate, and common salt.[18] Two of them became so weak that it seemed they should be shot. Instead they were given two ounces of sheep liver minced very fine, mixed with a thin flour gruel as a drench once daily. The other two colts, which were not so severely affected, were kept as controls.

After the second dose the weaker ones developed an appetite. Then the minced liver was mixed with bran, oats and chopped hay; they ate this, but refused any feed that did not contain liver. The amount of liver given was tapered off and at the end of a week the ponies were much improved. The controls, which had not received liver, were much weakened, and they refused feed. They were then given the same liver treatment and reacted in like manner. All recovered after a much shorter convalescent period than is common in this disease.

[18] Forsyth, A. A., 1941. Raw liver for anemia in horses caused by red worms. *Vet. Jnl.* 97:2, p. 71.

Book Review

Rabies. *By Leslie T. Webster,* M.D., Division of Pathology and Bacteriology of the Rockefeller Institute for Medical Research. Cloth bound; 168 pages. The MacMillan Company, New York, N. Y., 1942. $1.75.

As the author points out in his foreword, there is surprisingly little literature on the subject of rabies available to the laity, or even to veterinarians, public health officials, or practicing physicians. "Data are scattered or collected in a usable form mostly in French or German monographs. Even there the lines are not clearly drawn between scientific fact as accepted today, theories based on incomplete data, and mere speculation. There is definite need, then, for some treatise on rabies, critical, fairly inclusive, but simple and available to all. This book is an attempt to fill that need."

Doctor Webster, who has been intimately associated with the Rockefeller Institute's research on rabies, particularly in connection with the development of mouse tests for diagnosis and for the evaluation of vaccines, has succeeded admirably in accomplishing his stated purpose. Attention is focused on the two problems of diagnosis and prevention, since these are uppermost in the minds of inquirers. The available literature is surveyed and the data contained therein discussed, the whole comprising an accurate, readable account of the rabies situation today. The texts of some state and city health ordinances relating to the licensing, disposal, and confinement of dogs, are included in appendices.

The uncertain results of laboratory experiments on the efficacy of rabies vaccines are perhaps stressed too strongly for the taste of the veterinarian who has found their value in field use; and many will not agree with the author's contention that "no vaccine has as yet been developed with sufficient qualifications to justify compulsory vaccination of dog or other animal populations." While Doctor Webster states that all data on vaccination *following* exposure to rabies have been negative or equivocal, he admits that certain vaccines have been shown to have definite immunizing potency against *subsequent* exposure. It appears rather illogical, therefore, to make the foregoing statement about prophylactic vaccination, and to follow it in the next chapter with the recommendation: "Persons exposed to rabies should be given vaccine treatment with confidence that then there is small likelihood of development of the disease." There can be, of course, no quarrel with the general conclusion that investigation of the efficacy of vaccine treatment should be continued from all angles.

In bringing together much information about rabies now scattered throughout the periodical literature, and in weeding out fact from fancy in the process, the book is a valuable one for the veterinarian. He will find it suitable likewise for recommendation to clients desirous of information on the subject.

You may obtain any book reviewed in this department by remitting the published price to the Book Department of VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago, Ill.

Useful Bulletins

Internal Parasites of Cattle. *Gerard Dikmans,* Zoological Division, Bureau of Animal Industry. U. S. D. A. Circ. No. 614. 60 pp., 12 figs. Price 10c.

Fowl Paralysis (Avian Leucosis Complex). *W. J. Hall,* Animal Disease Station, Bureau of Animal Industry. U. S. D. A. Circ. No. 628. 13 pp., 4 figs. Price 5c.

Dairy Cattle Breeds. Amer B. Nystrom, Bureau of Dairy Industry, U. S. Department of Agriculture. 34 p., illus. (F. B. 1443F., rev.). Price 10c.

Experiment Station Record. Vol. 86, No. 3, March 1942, U. S. Department of Agriculture. Price $1 per volume (2 volumes a year) consisting of 6 monthly numbers and index; single numbers for sale only. Price 15c.

Weeds in Kansas. *Frank C. Gates,* Department of Botany and Plant Pathology, Kansas State College. Authentic data about practically all the known weeds of the state, totaling nearly 400, with botanical descriptions, illustrations, and methods of control. Kansas State Department of Agriculture. 360 pp. Sent free to Kansans on request.